55-4920-341-14

TM 55-4920-341-14

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL (WITH ILLUSTRATED PARTS BREAKDOWN)

TEST STAND, HYDRAULIC SYSTEM, GASOLINE ENGINE DRIVEN

MODEL D-5B

FSN 4920-832-5491

This copy is a reprint which includes current pages from Changes 1 and 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY
JANUARY 1972

D 101. 11:

READEX FICHE best copy available

WARNING

PRECAUTIONARY DATA

Personnel performing operations, procedures, and practices which are included or implied in this technical manual shall observe the following warnings. Disregard of these warnings and precautionary information can cause serious injury, death or destruction of material.

FUEL SYSTEM. Always provide a metal-to-metal contact between the container and fuel tank when filling the tank with fuel. This will prevent a spark from being generated as gasoline flows over the metal surfaces.

Never fill fuel tank while engine is in operation or hot, to avoid possibility of spilled fuel causing a fire.

CARBON MONOXIDE. Never operate engine in a closed building, unless the exhaust, which contains carbon monoxide, is piped outside. Inhalation of exhaust can cause serious illness or death.

FLUID BYPASS VALVE. Do not connect or disconnect any hoses with the fluid bypass valve closed and the test stand in operation.

BATTERY ACID. Battery electrolyte contains sulfuric acid and can cause severe skin burns. If the electrolyte comes in contact with the body, clothing or painted surfaces, rinse immediately with clean water.

ADJUSTMENTS ON CONNECTED EQUIPMENT. Never make adjustments on equipment while it is connected to the engine, unless the ignition cable is removed from the engine's spark plug. Turning over the equipment by hand during adjusting or cleaning might start the engine and equipment with it, causing serious injury to the operator.

NOTE

This manual has not been prepared according to military specifications; but despite the limitation of its contents, the publication does provide the essential data needed to operate and to maintain the equipment.

TM 55-4920-341-14
C3

HANGE
No. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 31 August 1987

Operator's, Organizational, Direct Support, and General Support Maintenance Manual (With Illustrated Parts Breakdown) Including Repair Parts and Special Tools List

TEST STAND, HYDRAULIC SYSTEM, GASOLINE ENGINE DRIVEN MODEL D-5B, NSN 4920-832-5491

TM 55-4920-341-14, 19 January 1972, is changed as follows:

Page 1, paragraph 1-2. In line 5, "AMSAV-M, P. O. Box 209" is changed to read "AMSAV-MPSD, 4300 Goodfellow Blvd., St. Louis, Mo. 63120-1798".

Page 1, paragraph 1-3. "TM 38-750" is changed to read "DA PAM 738-751".

Page A-3. Add to the last sentence of paragraph 4a the following:

The higher level of maintenance has the authority to determine:

(1) If the lower level is capable of performing the work.

(2) If the lower level will require assistance or technical supervision and n-site inspection.

(3) If the authorization will be granted.

Page 102, item 2. The following changes are made in the columns indicated:

Part No. 30593 is changed to read "1-YKF-18677-ASA". Vendor 61349 is changed to read "38508".

Page 8, Appendix D. Change the second item under the heading "Control Panel Assembly" as follows:

Column (2): 6620-133-7703 is changed to read "6685-00-557-0613.

Column (3): 30573 is changed to read "1-YKF-18677-ASA" and (61349) to read "(38508)".

Page 16. Delete Stock Number 6620-133-7703 and associated figure and item numbers.

Page 16. Add before Stock Number 9905-202-3639 and associated figure and item numbers: "Stock Number 6685-00-557-0613, Figure Number 28 and Item Number 2".

Page 18. Delete Reference Number 30573 and associated Mfg Code, Figure Number and Item Number.

age 18. Add after Reference Number 06096, associated Mfg Code, Figure Number and Item Number, "Reference Number 1-YKF-18677-ASA, Mfg Code 38508, Figure Number 28 and Item Number 2".

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31, -10, AVUM and AVUM Requirements for all Fixed and Rotory Wing Aircraft.

CHANGE
o. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *24 July 1974*

Operator's, Organizational, Direct Support, and General Support Maintenance Manual (With Illustrated Parts Breakdown) Including Repair Parts and Special Tools List

TEST STAND, HYDRAULIC SYSTEM, GASOLINE ENGINE DRIVEN
MODEL D-5B, FSN 4920-832-5491

TM 55-4920-341-14, 19 January 1972, is changed as follows:

Page 1, paragraph 1-2. In line 4, "Commanding General" is changed to read "Commander".

Page 1, paragraph 1-2. In line 5, "AMSAV-M" is changed to read "AMSAV-FR".

Page 31. Paragraph 1-45(1) is superseded as follows:

(1) Open fluid bypass valve by turning handle fully counterclockwise.

Page 31, paragraph 1-45. Paragraph (6) is added after paragraph (5) as follows:

(6) Open gage snubber valve.

age 32. Add Caution note to paragraph 1-45(E) as follows:

CAUTION

Close compensator shut-off valve

Page 32. Paragraph 1-45(G) is superseded as follows:

(G) Open compensator shut-off valve; adjust the compensator control until the fluid pressure gage indicates pressure slightly higher than the maximum pressure of the system being tested.

CAUTION

Adjust the compensator control for a zero reading on the fluid pressure gage when the compensator is not in use.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

ISTRIBUTION:
To be distributed in accordance with DA Form 12-31 (qty rqr block no. 94) Organizational Maintenance Requirements for all Fixed and Rotor Wing Aircraft.

Technical Manual)
)
No. 55-4920-341-14)

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C., 19 January 1972

Operator's, Organizational, Direct Support, and General Support Maintenance Manual

(With Illustrated Parts Breakdown)

TEST STAND, HYDRAULIC SYSTEM, GASOLINE ENGINE DRIVEN MODEL D-5B

FSN 4920-832-5491

Section	Paragraph	Title	Page
I		Introduction	
	1-1	Scope	1
	1-6	Operation Instructions	12
	1-12	Controls & Instruments	22
	1-41	Operation Under Usual Conditions	26
	1-47	Operation Under Unusual Conditions	33
II		Operation & Organizational Maintenance Instructions	
	2-1	Operator & Organizational Maintenance Instructions	36
	2-2	Special Organizational Tools & Equip.	36
	2-3	Lubrication	36
	2-6	Preventive Maintenance Services	39
	2-9	Troubleshooting	42
	2-24	Hydraulic System	45
III	3-1	Direct & General Support Maintenance Instructions	
	3-2	Special Direct and General Support Maintenance Tools & Equipment	48
	3-3	Preventive Maintenance Services	48
	3-6	Troubleshooting	52
	3-27	Radio Interference Suppression	57
IV	4-1	Engine Maintenance Instructions	59
V		Repair Parts List (Illustrated)	62

Page

APPENDIX A. MAINTENANCE ALLOCATION CHART........................ A-1

B. ENGINE OPERATION AND MAINTENANCE INSTRUCTIONS...... B-1

C. HYDRAULIC PUMP MAINTENANCE INSTRUCTIONS............ C-1

hold the test stand in a fixed position during operations. The trailer rolls on pneumatic tires (9-Fig. 1). Tie-down rings (11-Fig.1) are provided for lifting or lashing down the test stand.

1-4.2.Engine. The engine (3-Fig.7) is a V-type, 4 cylinder, 4 stroke cycle, air cooled unit. A 12 volt battery (4-Fig.7) is employed to power the starter. Engine speed is held automatically at the selected rpm (Revolutions per minute) by a centrifugal fly-weight governor which adjusts the throttle to compensate for changes in engine load.

1-4.3.Fluid Oil Reservoir. This reservoir (7-Fig.7A) is mounted in the upper rear of the housing assembly with the reservoir fill cap (7-Fig.6) accessible through the fluid tank overhead access door assembly (4-Fig.1). A reservoir shutoff valve (18-Fig.8) is provided for isolating the test stand reservoir from the hydraulic system when using fluid from the aircraft reservoir or when the test stand is utilized to drain the hydraulic system of the aircraft. Door assemblies (3&4-Fig.1) provide access to the reservoir for service and maintenance.

1-4.4.Hydraulic Pump. The hydraulic pump (6-Fig.7) incorporates the following features: a fluid volume control (3-Fig.3) providing regulation of pump delivery from 0 to 10 gpm (gallons per minute) at operating pressures ranging from 400 to 5000 psi (pounds per square inch) output, an adjustable compensating control (20-Fig.8) mounted on the control panel, which at the predetermined pressure, reduces pump delivery to the minimum requirements to maintain pressure in the system. The pump is protected from overheating by a thermoswitch (16-Fig.7) mounted in the pump header block (14-Fig.7) which stops the engine when the fluid in the pump exceeds 160 degrees F.

NOTE

> For the purpose of explanation the front of the unit is considered the towbar end and the right and left are referenced to an operator standing at the rear of the unit and facing towards the towbar end.

1-4.5. The rear compartment (Fig.3) of the test stand contains the service hoses and related hose accessories. This compartment is accessible through the rear end access doors (8-Fig.2). The rear bulkhead (2-Fig.3), accessible through the rear access doors, contains handhole openings designed to facilitate maintenance of the test stand. The fluid volume control (3-Fig.3) for pump volume adjustment is mounted on the rear bulkhead. The control panel access door (1-Fig.2) gives access to the Minor Control Panel (11-Fig.6) which houses the fluid high pressure gage, low pressure gage, fluid temperature gage, ammeter, engine fuel gage, engine oil gage, engine tachometer and hourmeter, high pressure filter warning light, low pressure filter warning light, fuel tank level indicator and oil reservoir (fluid) level indicator (1 thru 11 - Fig.8).

This panel is shock mounted on to the Major Control Panel, (1-Fig6), which houses the throttle control, fluid flow indicator, high pressure gage test fitting, gage snubber valve, reservoir shut off valve, compensator control, compensator control shut-off valve, low pressure filter selector valve, fluid bypass valve, high pressure relief valve, ½ inch flow control valve, 3/4 inch flow control valve, and outlet selector valve. (12 thru24- Fig.8).

Attached to the Major Control Panel, the Engine Start Panel houses the choke control, starter switch, ignition switch and the fuse and fuse holder. (1 thru 4-Fig.9).

1-5. (A) Access is gained to the fluid oil reservoir filler assembly (7-Fig.6) by the Fluid Tank Overhead Access Door. This door is provided with a fastening device to hold the door in a fully open position.

(B) The Engine Overhead Access Doors (5-Fig.1) allow entry and ventilation to the engine compartment. These doors are provided with a fastening device to hold doors in a fully opened position.

(C) The Engine Access Side Doors (2-Fig.1 & 2-Fig.2) permit entry to the engine compartment and supply ventilation to the engine.

(D) The Fuel Tank Access Door (3-Fig.1) allows access to the fuel tank (12-Fig.6 & 13-Fig.7A) and fuel filler spout. Mounted on the inside of the access door is a holder for storing the test stand instructions manual and related literature.

(E) The Housing Assembly is removed by unsnapping ten fasteners and lifting from frame.

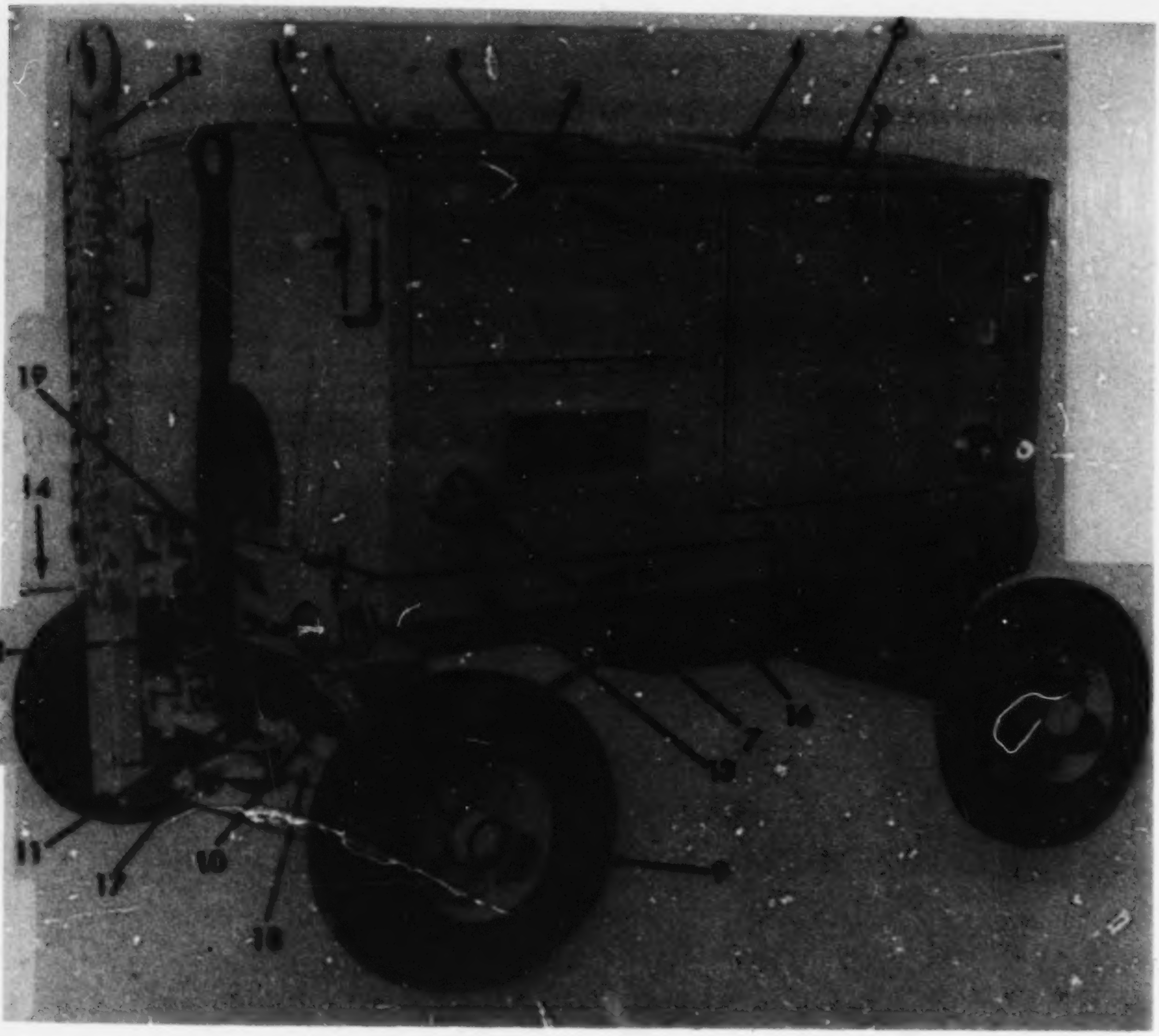


Figure 1 Hydraulic Test Stand D-5B

Three-Quarter Left Front View

1. Housing Assembly
2. Engine Access Door Assembly Left Side
3. Fuel Tank Access Door Assembly
4. Fluid Tank Overhead Access Door Assembly
5. Engine Overhead Door Assembly
6. Door Holder
7. Reflectors - Amber
8. Reflectors - Red
9. Pneumatic Tire
10. Front Spring Assembly
11. Tie Down Ring
12. Draw Bar Assembly
13. Hold Down Latch
14. Brake Lever
15. Hose Retainers
16. Gasoline Tank
17. Steering Assembly
18. Front Axle Assembly
19. Frame Assembly

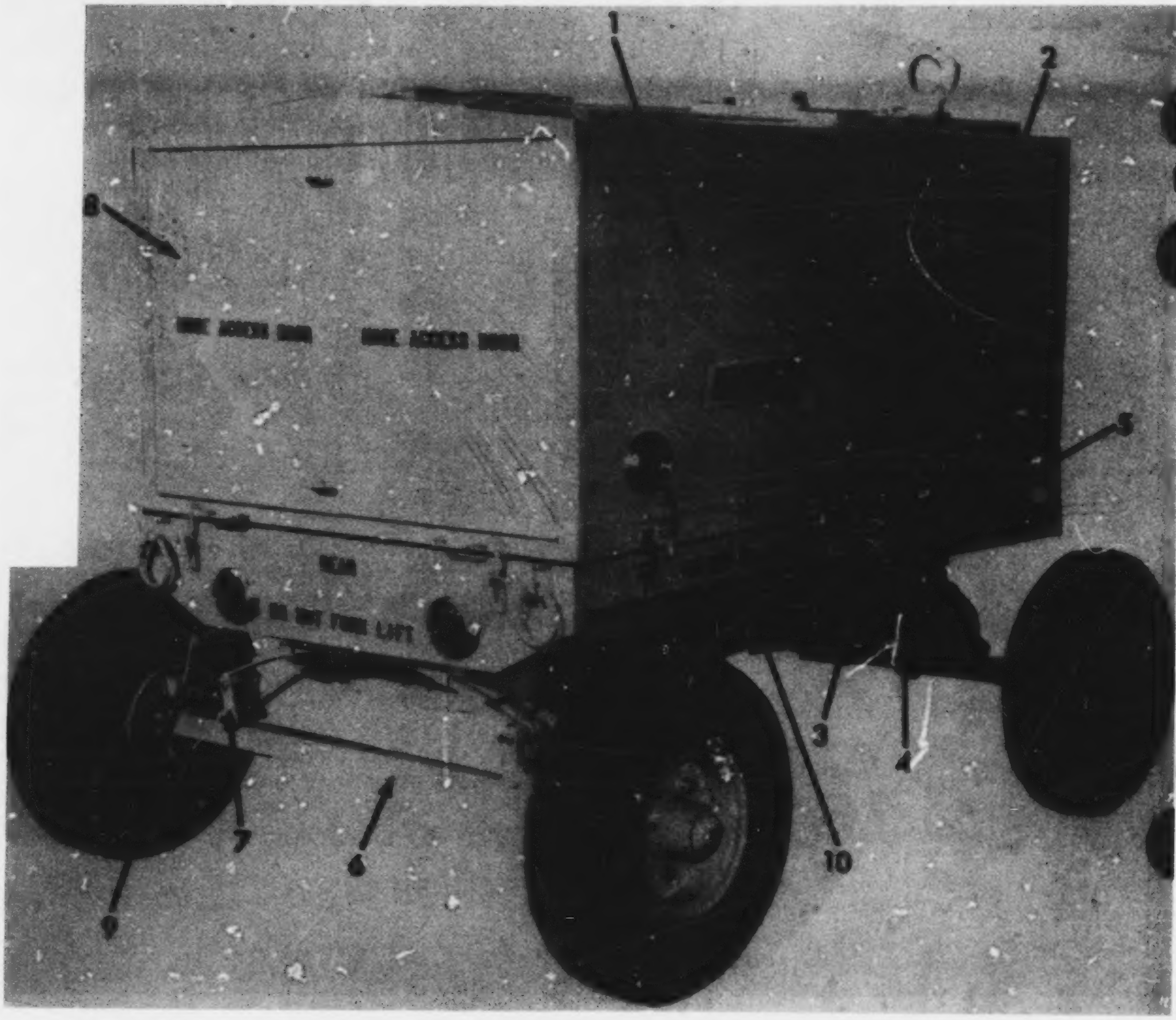


Figure 2 Hydraulic Test Stand D -5B

Three-Quarter Right Rear View

1. Control Panel Access Door Assembly
2. Engine Access Door Assembly-Right Side
3. One-half inch outlet Coupling with dust cap.
4. Three-quarter inch outlet coupling with dust cap.
5. One inch inlet coupling with dust cap.
6. Rear Axle Assembly
7. Rear Spring Assembly
8. Rear Access Door Assembly
9. Brake Lever
10. Tie Rod

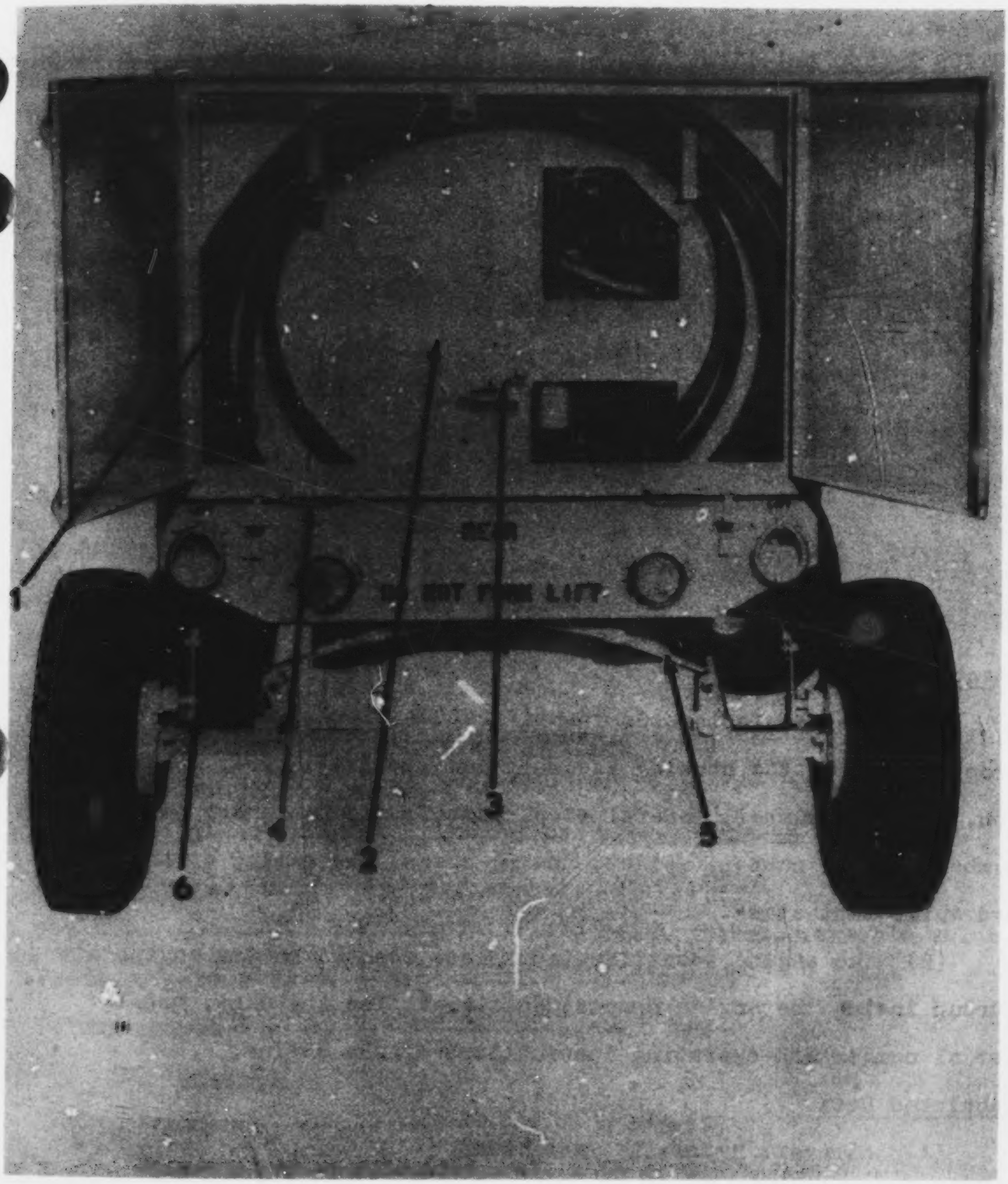
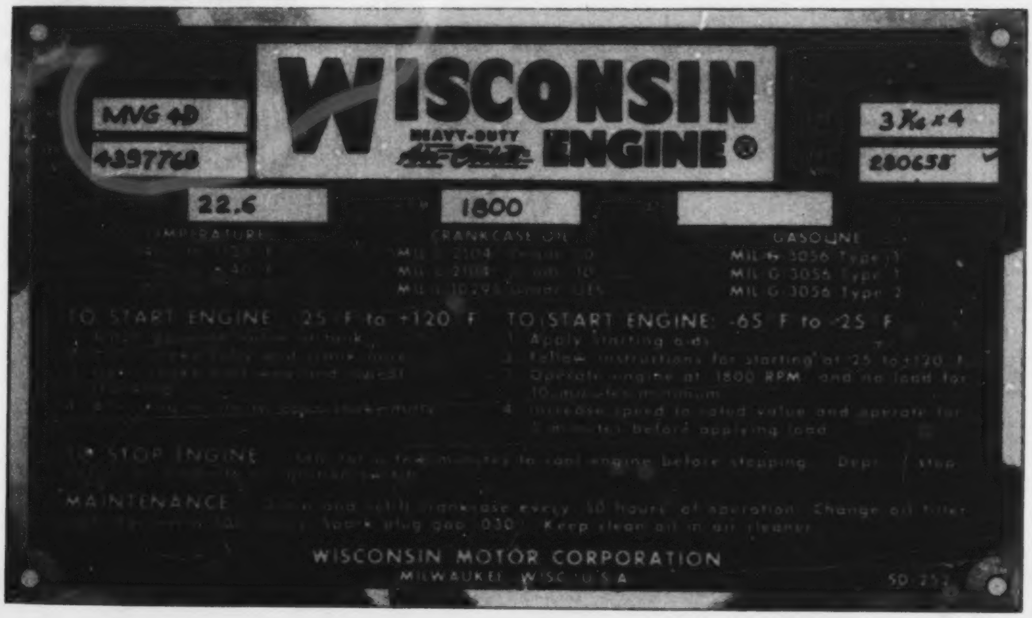

1
2
3
4
5
6
DO NOT FORK LIFT

Figure 3 Hydraulic Test Stand D-5B Rear View

1. Hose Hook
2. Rear Bulkhead
3. Fluid Volume Control
4. Lift Handle
5. Rear Spring Assembly
6. Brake Rod


WISCONSIN
HEAVY-DUTY
Air-Cooled
ENGINE
MVG 4D
4397768
3 3/16 x 4
280658
22.6
1800
CRANKCASE OIL
GASOLINE
TO START ENGINE 25 F to +120 F
TO START ENGINE -65 F to -25 F
TO STOP ENGINE
MAINTENANCE
WISCONSIN MOTOR CORPORATION
MILWAUKEE WISC U.S.A.
SD-252

Identification

(A) The manufacturer's identification plate is located on the front center of the housing assembly and specifies type, specification, contract number, Federal stock number, manufacturers part number, serial number, weight, towing speed, and rating of the hydraulic test stand.

(B) The engine identification plate mounted on the engine air shroud inside the engine compartment, specifies the make, model, serial number and operating instructions of the engine.

Tabulated Data

(A) Aircraft Hydraulic Test Stand

Manufacturer----------------------------Janke and Co.

Model------------------------------------ D-5B

Operating Range:

Altitude--------------------------- Sea level to 6000 ft.

Ambient temperature---------------- -20 degrees F. to 120 degrees F.

SECTION I (Con't.)

Humidity	95 to 100%
Deflection	8½ degrees in any plane from horizontal.

(B) Engine

Manufacturer	Wisconsin Motor Corp.
Model	MVG4D, size 3-7/16 x 4, Spec. No. 280658 Net Cont. BHP 22.6 RPM 1800
Cycle	4 stroke
Cylinders	4
Cooling	Air
Cylinder bore	3¼ inch
Stroke	4 inches
Piston displacement	148.5 cubic inch
Horsepower	36 at 2200 rpm
Firing order	1-3-4-2

(C) Hydraulic pump

Manufacturer	Weatherhead Co.
Model	408-01180-01
Type	Axial piston, variable volume
Pressure output	0-5000 psi
Volume output	0-10 GPM

(D) Capacities

Engine crankcase	5 quart
Engine fuel tank	18 gallons
Hydraulic reservoir	25 gallons

CAPABILITIES AND LIMITATIONS

(A) The test stand is a self contained mobile testing unit, capable of delivering a continuous flow of hydraulic fluid at the rate of 0 to 10 gallons per minute, at pressures from 400 to 5000 PSI.

(B) The test stand is also capable of maintaining a rated output of 10 gallons per minute at 3000 psi or 5 GPM at 5000 psi at the same time that the inlet fluid pressure to the stand is varied throughout the range of 16 inches HG absolute to 110 PSIG pressure.

(C) The test stand will operate efficiently within the temperature range from -20 degrees F to 120 degrees F.

GENERAL SPECIFICATIONS

Weight	2500 lbs.
Height (excluding towbar)	55 in.
Length (excluding towbar)	78½ in.
Width (overall)	57 in.
Wheel tread (distance between center of tire)	49 in.
Wheel Base	59 in.
Tire type	Pneumatic
Tire size	6:00 x 9
Tire pressure	60 PSI
Max. Towing Speed (smooth surface)	20 mph
Max. Towing Speed (rough surface)	8 mph
Servicing Hoses	10 ft.
Fluids Useable In Equipment	MIL-L-5606

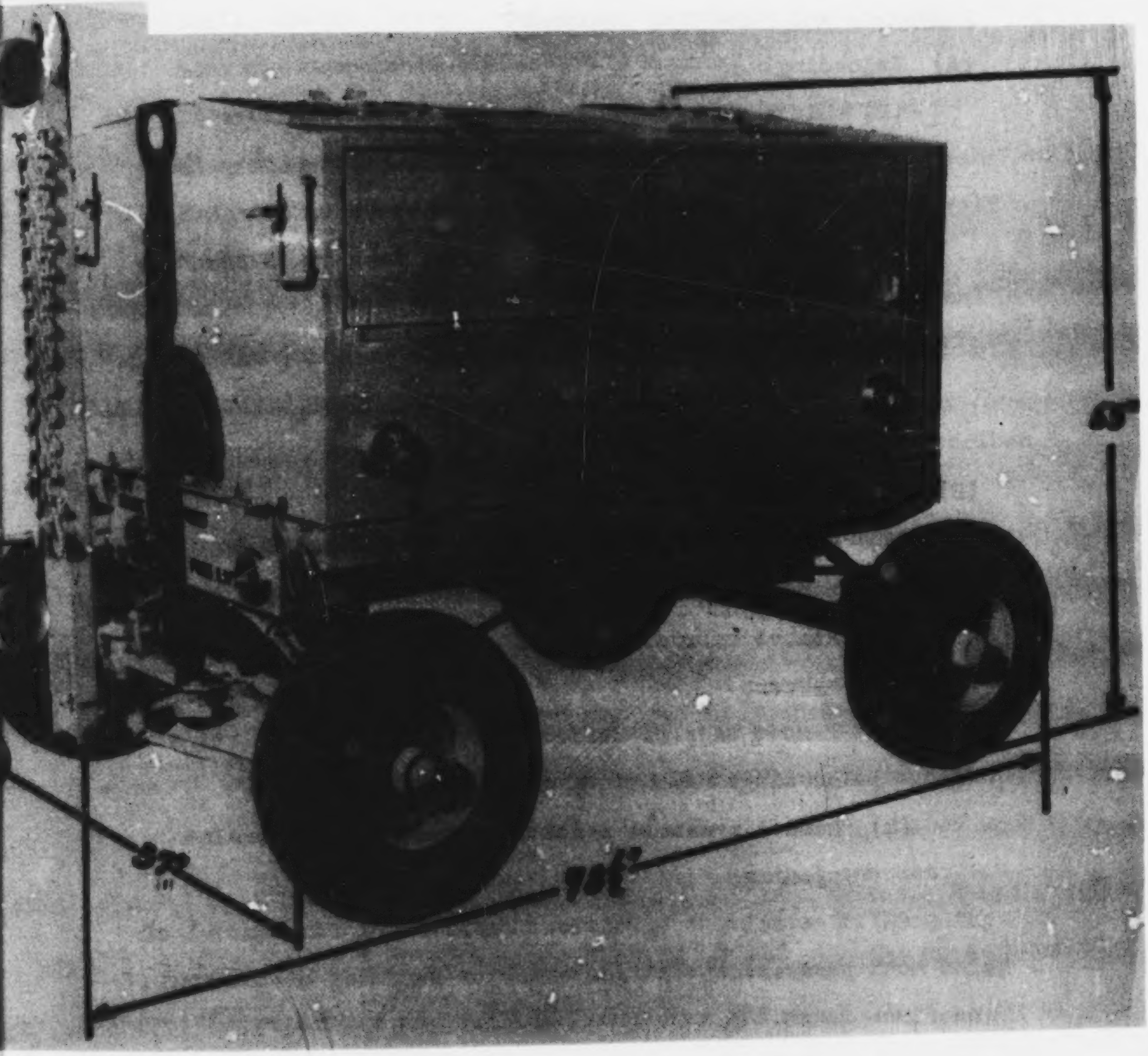


Figure 5 Shipping Dimensions

1-6 Operating Instructions

1-7 Unloading and Unpacking Equipment

(A) Unloading.

(1) Disconnect tie-down straps.

(2) Where a lifting device of suitable capacity (over 3000 lb.) is available, connect cable slings to lifting eyebolts and lift the test stand from the carrier.

(3) When a lifting device is not available, build a ramp with suitable lumber and tow the test stand off the carrier.

(B) Unpacking.

(1) Remove pressure sensitive tape from seams, doors, panels, screen, and ventilation ducts.

(2) Remove barrier material from ventilation ducts and screens.

(3) Remove bags of desiccant from inside test stand housing.

(4) Remove pressure sensitive tape from all sealed openings.

(5) Use solvent specification PP-S-661 for removal of preservatives from exterior surfaces of the equipment.

1-8 Inspection of New Equipment

(A) Perform the before-operation services described in paragraph 2-8.

(B) Make a complete visual inspection of the test stand for dents, cracks, breaks, and loose or missing parts. Make sure all components are securely mounted.

(C) Inspect control panels for cracked or broken glass and damaged parts.

(D) Inspect the tires for cuts, fabric breaks, and excessively worn treads.

(E) Correct all deficiencies or report them to organizational maintenance.

1-9 Servicing New Equipment.

(A) General. Perform the before-operation services as described in paragraph 2-8.

(B) Lubrication. Lubricate the test stand in accordance with the lubrication chart table I.

(C) Fuel System.

(1) Filling Fuel Tank. Remove the fuel tank cap and fill the fuel tank to capacity with the proper grade fuel, specification MIL-G-3056 or MIL-F-5572. Use a clean container.

WARNING: Always provide a metal-to-metal contact between the container and fuel tank when filling the tank with fuel. This will prevent a spark from being generated as gasoline flows over the metal surfaces.

(2) Fuel Strainer.

(a) Close the shutoff cock of the fuel strainer by turning its handle fully clockwise.

(b) Loosen the thumbnut and cup, swing the clamp wire and stud to one side and remove the glass bowl, gasket, and filter screen from the bowl cover.

(c) Wash the bowl and screen in an approved cleaning solvent and wipe the bowl dry with a lint-free cloth.

(d) Install the screen, gasket, and bowl in the cover and secure with the clamp wire and the thumbnut.

(e) Open the shutoff cock and check the fuel strainer for leaks.

(D) Battery.

(1) General. The battery of a new test stand is shipped dry charged and must be filled with electrolyte before use. Fill each cell to the level indicator or 3/8 inch over the plates.

WARNING: Battery electrolyte contains sulfuric acid and can cause severe skin burns. If the electrolyte comes in contact with the body, clothing or painted surfaces, rinse immediately with clean water.

(2) Removal.

(a) Disconnect the two battery terminal adapters from the terminals of the battery.

(b) Remove the 2 hex nuts, 2 lockwashers, and 2 flat washers that secure the cover assembly and battery to the battery tray and remove the battery.

(3) Installation.

(a) Place the battery in the battery tray, mount the cover assembly on the battery and secure with the

2 flat washers, and 2 lockwashers, and 2 hex nuts.

(b) Clean all corrosion from the battery terminal adapters and terminals. Apply a thin film of grease to the terminals and adapters and connect the cables to the battery.

(E) Tires. Check the tire inflation. Correct tire pressure is 60 PSI.

(F) Hydraulic System.

(1) Drain the preservative fluid from the system by removing the drain plug from the bottom of the low pressure filter.

(2) Install the drain plug. Remove the reservoir fill cap and fill the reservoir with 20 gallons of hydraulic fluid, Specification MIL-O-5606.

NOTE. Do not overfill the hydraulic reservoir. The expansion space in the reservoir is necessary for satisfactory test stand operation.

(3) Bleed air from the hydraulic system as described in Section 2-26.

1-10. Inspection of Used Equipment.

Inspect a used test stand, following the instructions contained in ection 2-8. Observe carefully the component parts that might be worn through use, such as connecting hose assemblies, tires, brakes, and drawbar assembly. Correct all deficiencies or report them to field maintenance.

-11. Servicing Used Equipment.

ervice a used test stand as outlined in Section 1-9. Pay particular ttention to the air cleaner, oil filter, fuel strainer, battery, and tires. Report all deficiences, found during servicing, to field maintenance for correction.

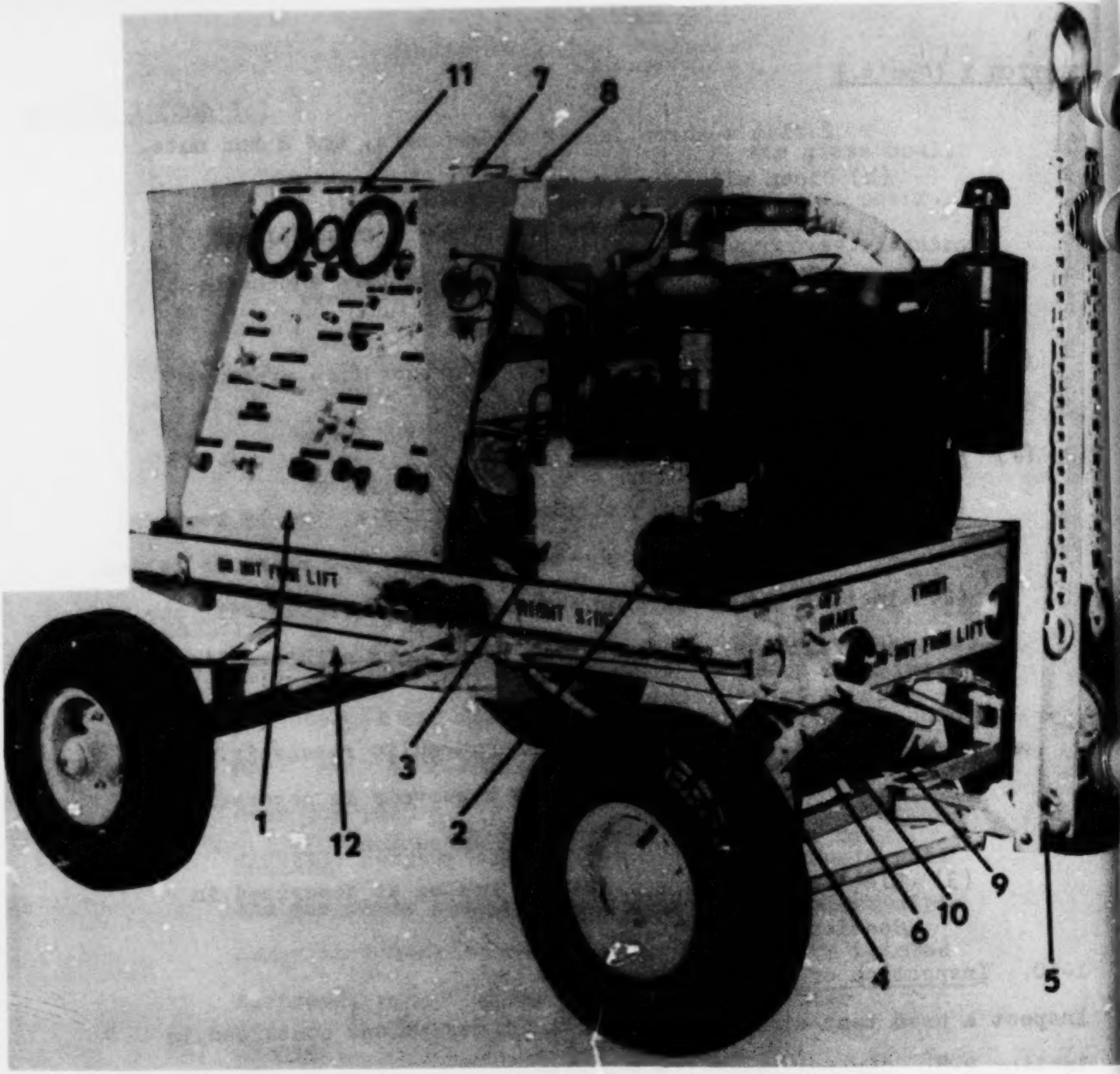


Figure 6 Hydraulic Test Stand D-5B

Three Quarter Right Front View

Housing Assembly Removed

1. Major Control Panel
2. Generator
3. R.F.I. Suppressor Box
4. Ground Lug
5. Steering Assembly
6. Front Spring Assembly
7. Fluid Oil Reservoir Filter Cap
8. Air Breather
9. Brake Assembly
10. Muffler
11. Minor Control Panel
12. Fuel Tank

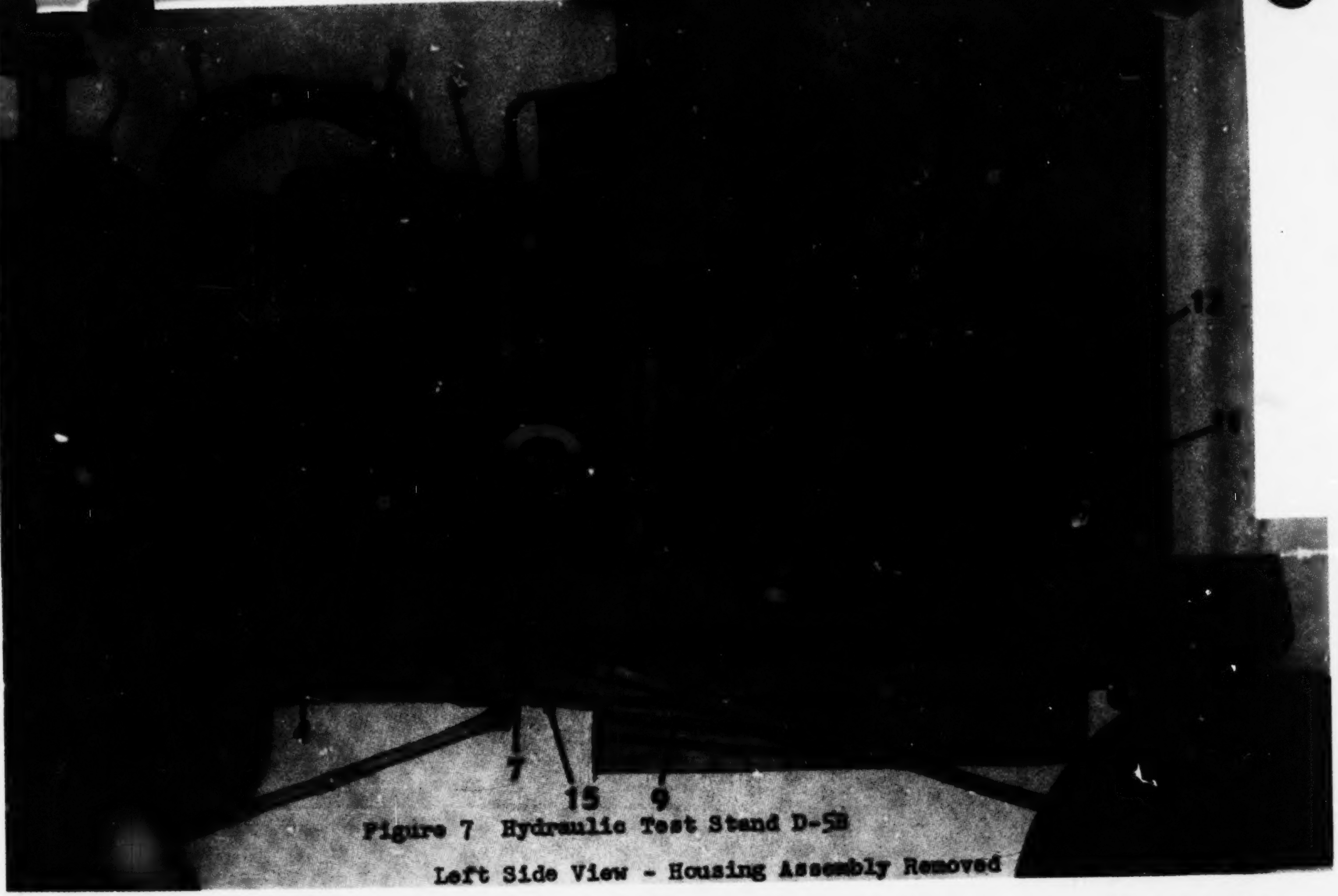


Figure 7 Hydraulic Test Stand D-5B

Left Side View - Housing Assembly Removed

1. Air Filter
2. Exhaust Hose Assembly
3. Engine
4. Battery
5. Low Pressure Filter
6. Pump
7. Engine-Pump Adapter
8. Reservoir Drain Valve
9. Reservoir Drain Pipe
10. Fuel Filler Cap Assembly
11. Low Pressure Differential Switch
12. High Pressure Filter
13. Fluid Volume Assembly
14. Pump Header Block
15. Brake Rod
16. Thermoswitch

Figure 7 A

Hydraulic Test Stand D 5 B

Three-Quarter Left Front View

Housing Assembly Removed

1. Engine
2. Exhaust Hose
3. Asbestos Cloth Sleeve
4. Engine Oil Filter
5. Muffler
6. Battery
7. Fluid Oil Reservoir
8. Generator
9. V Belt
10. Frame Assembly
11. Air Filter
12. Low Pressure Hydraulic Fluid Filter
13. Fuel Tank

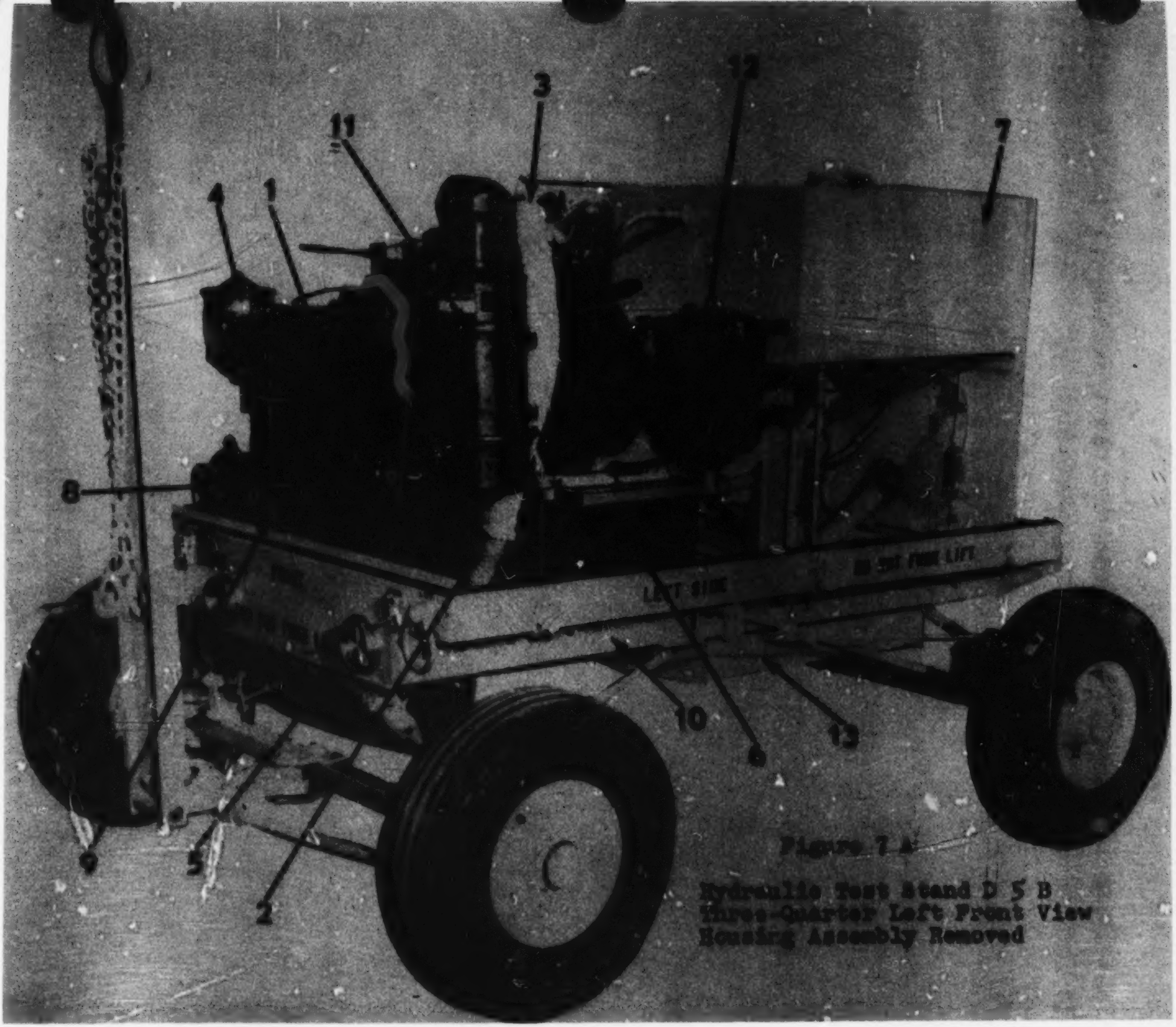

11
3
12
7
4
1
8
LEFT SIDE
DO NOT FORK LIFT
10
6
13
9
5
2

Figure 7 A

Hydraulic Test Stand D 5 B
Three-Quarter Left Front View
Housing Assembly Removed

Figure 7 B

Hydraulic Test Stand D 5 B

Close-up View Right Front Side

1. Engine Name Plate
2. Engine Oil Filter
3. Generator Bracket
4. Generator
5. Cable Connection,Generator to Ground
6. Generator Housing For R.F.I. Suppression
7. One Inch Half Coupling Return From Engine
8. Pressure Regulating Valve
9. Stainless Steel Teflon-lined Hose
10. Low Pressure Relief Valve
11. Elbow Connection From Engine Manifold To Flexible Steel Exhaust Hose
12. Ground Connection

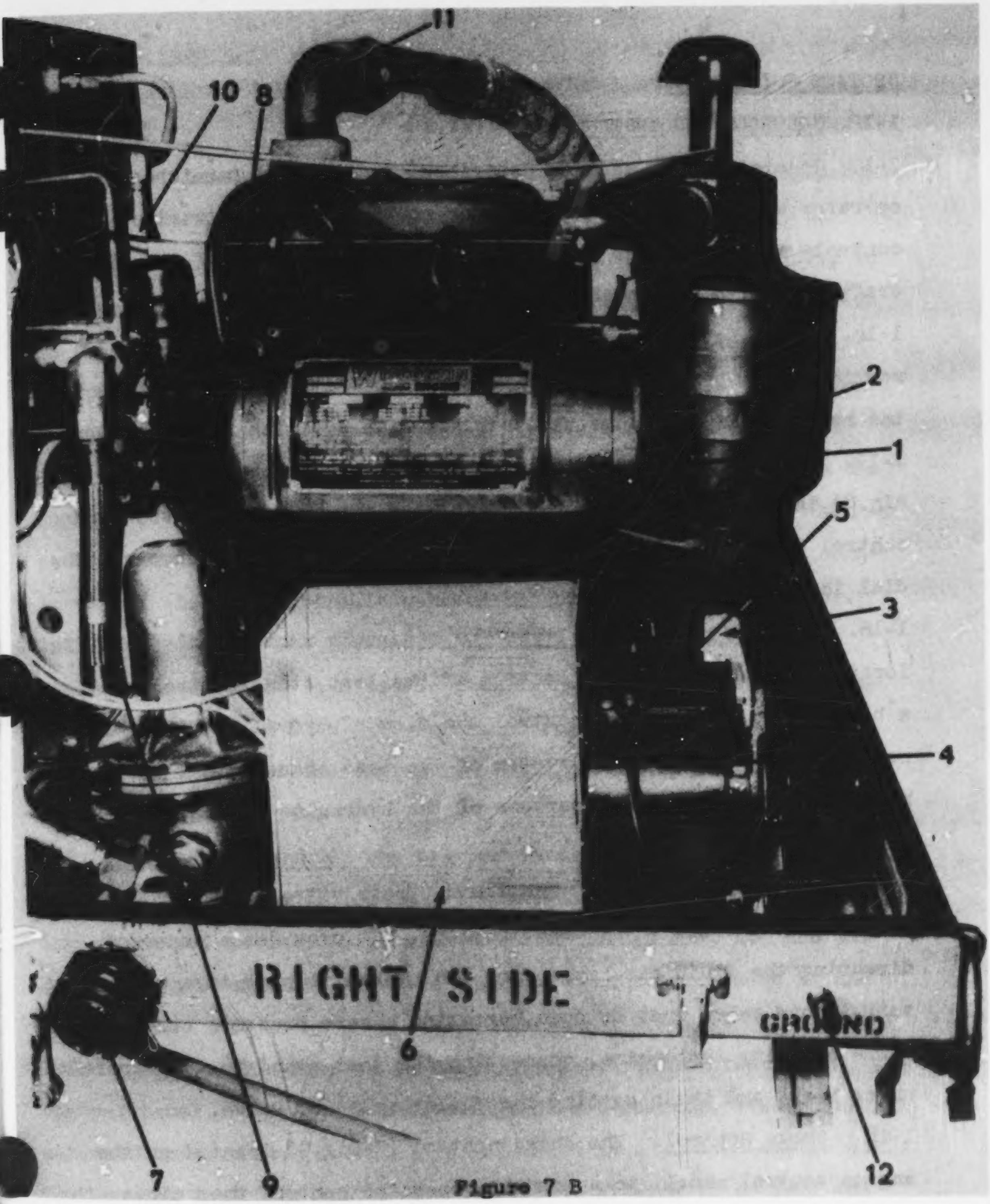

11
10
8
2
1
5
3
4
RIGHT SIDE
GROUND
6
7
9
12

Figure 7 B

Hydraulic Test Stand D 5 B

Close-up View Right Front Side

1-12 CONTROLS AND INSTRUMENTS

1-13 General. This section describes, locates and furnishes the operator with sufficient information pertaining to the various controls and instrument provided for proper operation of the aircraft hydraulic test stand.

1-14. Break Lever Assembly. The brake lever assembly (14-Fig.1), mounted on the front of the frame assembly, sets the brake shoes in the rear wheels to secure the test stand in position for operation.

1-15. Reservoir Level Indicator. The reservoir level indicator (11-Fig.8) is located in the upper right hand corner of the test stand control panel. It indicates the liquid level in the reservoir. The dial is marked E. ½, and F.

1-16. Reservoir Shutoff Valve. The reservoir shutoff valve (18-Fig.8) located in the left center section of the test stand control panel is a ball valve, provided to control the flow of hydraulic fluid from the reservoir to the hydraulic system of the test stand. This valve must be closed when the reservoir of the bydraulic system under test is to be utilized.

1-17. Fluid Bypass Valve. The fluid bypass valve (19-Fig.8) is located directly below the schematic plate. It provides a means of directing the fluid discharge from the hydraulic pump into the reservoir. This valve must be open, creating a zero pressure condition, while starting the engine, connecting the test stand to the aircraft under test, and while setting the outlet selector valve.

1-18. Choke Control. The choke control (1-Fig.9) located on the engine control panel, is a manually operated control that closes the butterfly in the carburetor, enriching the fuel mixture for starting a cold engine.

1-19 Throttle Control. The throttle control, (10-Fig.8), located on the control panel, is a push-pull, twist lock control used to set the governor for the desired engine rpm.

1-20 Ignition Switch. The ignition switch (4-Fig.9) is mounted in the upper lefthand corner of the engine control panel. When placed in the OFF position, the ignition switch grounds the magneto thus stopping the engine. In the ON position the magneto is ungrounded and the fuel and oil reservoir level gages are energized.

1-21 Starter Switch. The starter switch (3-Fig.9), mounted on the engine control panel, is a spring loaded, push-type switch. When pressed inward, it energizes the armature relay which in turn completes the electrical circuit between the battery and the starter.

1-22 Tachometer. The Tachometer (8-Fig.8), mounted on the test stand control panel, is a needle-indicating, direct-reading instrument graduated from 0 to 2500 rpm in increments of 50 rpm. The tachometer indicates the engine rpm. The normal operating speed is approximately 2200 rpm.

1-23 Oil Pressure Gage. The oil pressure gage (9-Fig.8), located on the test stand control panel, is a needle-indicating, direct-reading, pressure, actuated gage with the dial marked OFF, XX, and ON. Normal oil pressure is indicated when the needle is between XX and ON ranges.

1-24 Ammeter. The Ammeter (6-Fig.8), mounted on the test stand control panel, is a needle-indicating, direct-reading, electrically actuated instrument. The dial is graduated in a 30-0-30 ampere scale. The ammeter indicates the amount of current flowing to or from the battery. With the engine in operation, the normal reading should be on the charge side of the 0.

1-25 Hourmeter. The hourmeter (8-Fig.8) is integral with the tachometer which is mounted on the test stand control panel, it is an electrically driven, direct-reading indicator with six numbered wheels, which record engine operating time in hours and tenths of hours. The time recorded is a guide for making operating checks, periodic inspections, and filter cartridge replacements.

1-26 Flow Control Valves. The 1/2 in. and 3/4 in. flow control valves (23 & 24 Fig.8), located on the lower right of the test stand control panel, control the flow of hydraulic fluid from the hydraulic test stand. In addition to the valve handles, locking devices are provided to secure the valves in their closed or open position.

1-27 Fluid Volume Control. The fluid volume control (3-Fig.3), located on the rear bulkhead, is reached through the rear access door. This control positions the cam plate of the pump to obtain the desired volume output. The adjusted output is indicated by the fluid flow indicator.

1-28 Fluid Flow Indicator. The fluid flow indicator (14-Fig.8), mounted on the test stand control panel, indicates hydraulic pump delivery. The indicator dial is graduated in 1 gallon increments from 0 to 10 gallons per minute.

1-29 High Pressure Relief Valve. The high pressure relief valve (22-Fig8), located in the lower center of the test stand control panel, is an adjustable, bypass-type relief valve with an operating range from 400 to 5000 psi. This valve serves as a safety device, protecting the hydraulic system under test from excessive pressure. A knurled locknut is provided to secure the valve in adjustment.

1-30 Compensator Control. The compensator control (20-Fig.8) located in the extreme left corner of the test control panel, is adjusted for the desired discharge pressure of the test stand. A locknut is provided to secure the control in adjustment.

1-31 Fluid Pressure Gage. The fluid pressure gage (1-Fig.8), mounted on the stand control panel, is a needle-indicating, direct-reading, pressure actuated gage. The dial is graduated from 0 to 6000 psi in increments of 50 psi. When the test stand is in operation the fluid pressure gage indicates the discharge pressure selected by the compensator control.

1-32 Gage Snubber Valve. The gage snubber valve (17-Fig.8), located below the pressure gage on the test stand control panel, is a needle-type valve provided to admit pressure to the fluid pressure gage.

1-33 Fluid Pressure Gage Tap. The fluid gage tap (12-Fig.8), extending through the test stand control panel, is provided for the connection of a test pressure gage to check the accuracy of the fluid pressure gage.

1-34 Filter Pressure Gage. The filter pressure gage (5-Fig.8), mounted on the test stand control panel, is a needle-indicating, direct-reading, pressure and vacuum actuated, compound-type gage. When used in conjunction with the pressure selector valve, the filter pressure gage indicates pressure drop through the low pressure filter. An indicated pressure drop of 20 psi necessitates replacements of the low pressure filter element.

1-35 Pressure Selector Valve. The pressure selector valve (15-Fig.8), located directly below the filter pressure gage is a two-way, plug type valve utilized to switch the filter pressure gage connection from the inlet to the outlet side of the low pressure filter, thereby determining the condition of the filter element.

1-36 Filter Pressure Gage Tap. The filter pressure gage tap (13-Fig.8), extending through the test stand control panel, provides a means of connecting a test gage to check the accuracy of the filter pressure gage.

1-37 Outlet Selector Valve. The outlet selector valve (16-Fig.8), mounted on the test stand control panel, is a 4-way, plug-type valve, providing a means of selecting either the 1/2 in. or 3/4 in. outlet connectiions of the test stand.

1-38 Fluid Temperature Gage. The fluid temperature gage (2-Fig.8), centrally located at the top of the test stand control panel, is a needle-indicating, direct-reading, temperature gage graduated from -20 to 250 degrees fahrenheit in increments of 2 degrees. During operation the indicated fluid temperature should never exceed 160° F.

1-39 Pressure Regulator Valve. The pressure regulator valve (8-Fig. 7B) is located in the 1 inch return line between the bulkhead hose connection and the low pressure filter manifold. The valve is a spring loaded, direct-acting diaphragm type, preset to maintain the rated output of the high pressure pump at the same time that the inlet fluid pressure to the stand is varied throughout the range of 16 inches HG absolute to 110 psig pressure without damage to the pump.

1-40 Low Pressure Relief Valve. The low pressure relief valve (10-Fig.7B), located in the manifold between the low pressure filter and the pressure regulator valve, protects the high pressure pump from excessive inlet pressure in the event that the pressure regulator valve should malfunction.

1-41 Operation Under Usual Conditions.

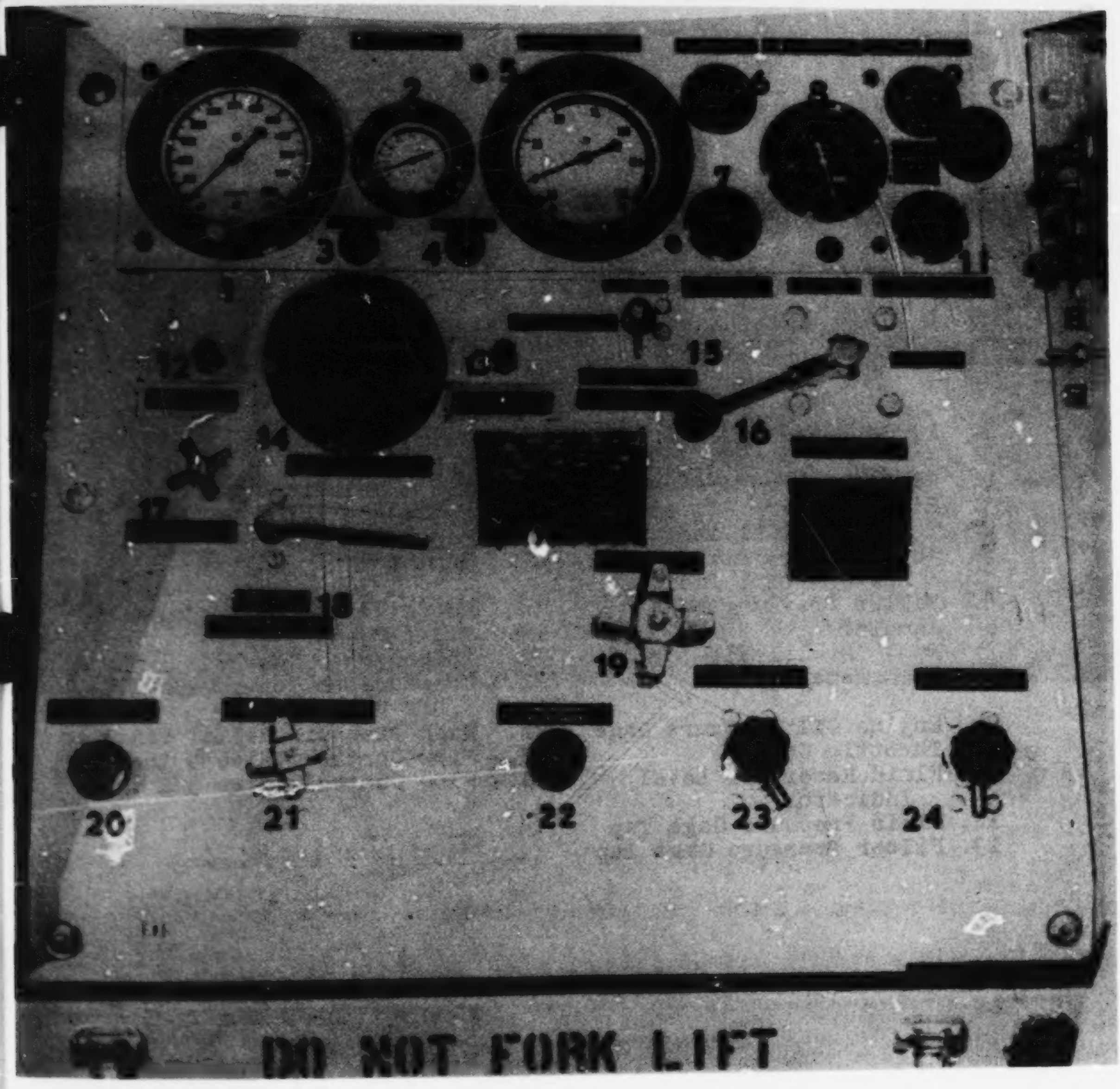

2
5
6
8
9
3
4
7
11
12
15
16
14
17
18
19
20
21
22
23
24
DO NOT FORK LIFT

Figure 8 Hydraulic Test Stand D-5B

Instrument Control Panel

Close-Up View

Figure 8

Hydraulic Test Stand D-5B

Instrument Control Panel

Close-Up View

1. Fluid Pressure Gage
2. Fluid Temperature Gage
3. High Pressure Filter differential indicator
4. Low Pressure Filter differential indicator
5. Filter Pressure Gage
6. Ammeter
7. Fuel Level Indicator
8. Tachometer
9. Engine Oil Pressure Gage
10. Throttle Control
11. Fluid Reservoir Level Indicator
12. Fluid Pressure Gage Tap
13. Filter Pressure Gage Tap
14. Warning Plate and Fluid Flow Indicator
15. Press Selector Valve
16. Outlet Selector Valve
17. Gage Snubber Valve
18. Reservoir Shut-Off Valve
19. Fluid By-Pass Valve
20. Compensator Control
21. Compensator Control Shut-Off Valve
22. High Pressure Relief Valve
23. Flow Control Valve ½ inch
24. Flow Control Valve 3/4 inch

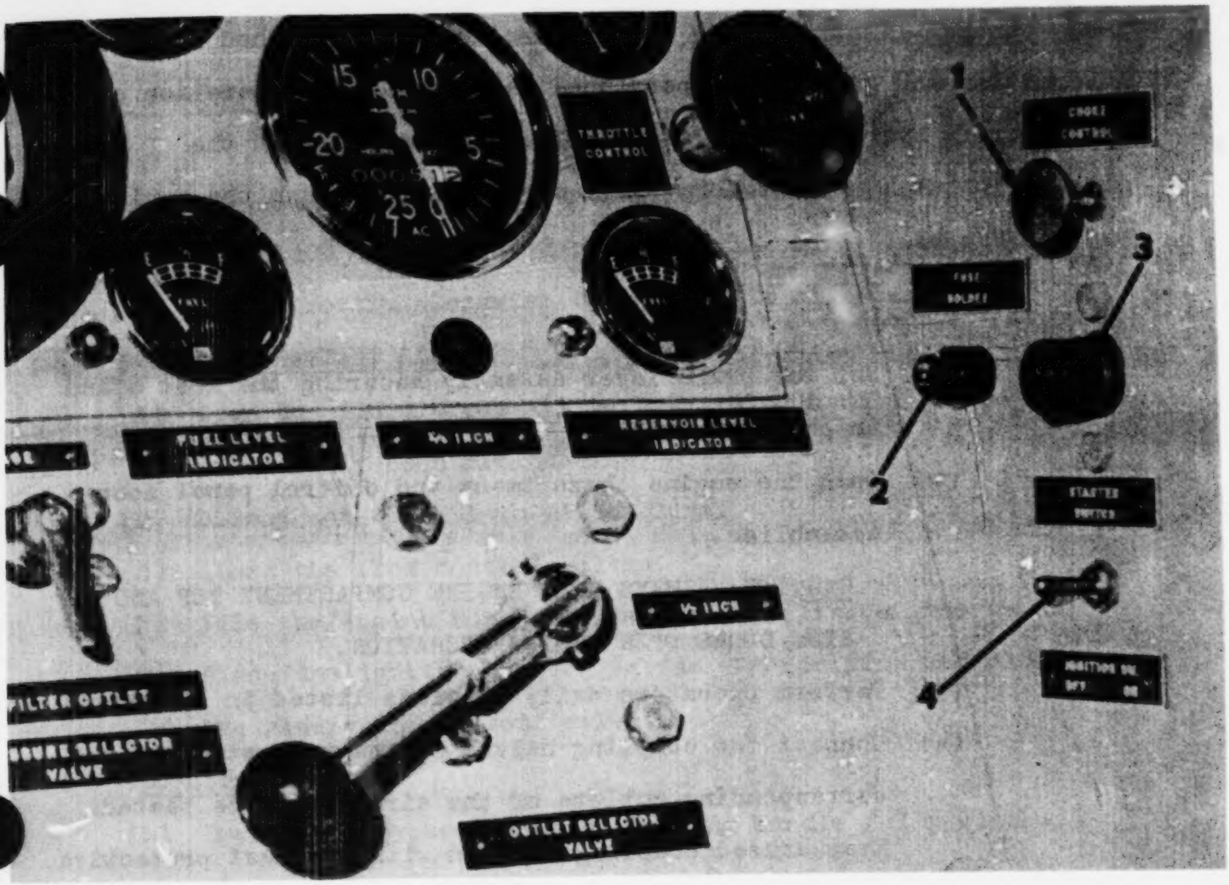

1
2
3
4
THROTTLE CONTROL
CHOKE CONTROL
FUSE HOLDER
STARTER BUTTON
IGNITION SW. OFF ON
FUEL LEVEL INDICATOR
1/4 INCH
RESERVOIR LEVEL INDICATOR
1/2 INCH
FILTER OUTLET
SSURE SELECTOR VALVE
OUTLET SELECTOR VALVE

Figure 9 Hydraulic Test Stand D 5 B

Instrument Panel - Ignition Control Section

1. Choke Control
2. Fuse & Fuse Holder
3. Starter Button
4. Ignition Switch

1-42 General. Instructions in this section are published for the information and guidance of personnel responsible for operation of the aircraft hydraulic test stand. It is essential that the operator knows how to perform every operation for which the equipment is capable

1-43 Starting The Test Stand.

(A) Preparation for Starting.

(1) Set the brake lever assembly securing the test stand in position.

(2) Open the engine compartment and control panel door assemblies.

CAUTION: ALWAYS KEEP ENGINE COMPARTMENT TOP AND SIDE DOORS OPEN DURING OPERATION.

(3) Perform Operators daily services listed in paragraph 2-

(4) Connect the coupling halves of the test stand to the corresponding outlets of the aircraft to be tested. Keep unused couplings capped with the dust protective caps.

(B) Electrical Starting.

(1) Open the fluid bypass valve by turning the handle fully counter-clockwise.

(2) Pull the choke control out.

(3) Pull the throttle control to one quarter open position

(4) Place the ignition switch in the ON position.

(5) Push the starter switch until engine starts.

(6) Open the choke control until the engine operates smoothly.

(7) Operate the engine at 1000 to 1400 rpm for approximately 10 minutes to warm engine up to normal

operating temperature.

(8) Set the throttle control for an engine speed of 1800 rpm indicated by the tachometer. Rotate the throttle clockwise to lock it in adjustment.

1-44 Stopping the Test Stand.

(A) Open the fluid bypass valve by turning handle of the valve fully counterclockwise.

(B) Disconnect the 1 inch return line.

(C) Close the flow control valves.

(D) Idle the engine for 5 minutes to normalize engine temp.

(E) Place the ignition switch in the OFF position and close the reservoir shutoff valve.

1-45 Operating Details.

(1) Open fluid bypass valve by turning handle fully clockwise

(2) Open High pressure relief valve by turning handle fully counterclockwise.

(3) Open compensator control by turning fully counterclockwise with screwdriver.

(4) Open reservoir shut off valve.

(5) Connect all hoses to aircraft under test.

(A) Close the two flow control valves.

(B) Increase engine rpm to 2150.

(C) Adjust the pump delivery to requirements of the aircraft under test with the Fluid Volume Control, as indicated by the fluid flow indicator. Turn the handle clockwise to increase delivery.

(D) Set selector valve for desired size outlet.

(E) Slowly close the fluid bypass valve.

WARNING: DO NOT CONNECT OR DISCONNECT ANY HOSES WITH THE FLUID BYPASS VALVE CLOSED AND THE TEST STAND IN OPERATION.

CAUTION: DO NOT REPOSITION THE OUTLET SELECTOR VALVE WITH THE FLUID BYPASS VALVE CLOSED AND THE TEST STAND INOPERATION.

(F) Adjust the high pressure relief valve to relieve pressure at approximately 200 psi above the system pressure of the unit under test. Clockwise rotation of the relief valve knob increases pressure setting, counterclockwise rotation decreases pressure setting.

CAUTION: 2150 RPM MUST BE MAINTAINED ON ENGINE.

(G) Adjust the compensator control until the fluid pressure gage indicates pressure slightly higher than the maximum pressure of the system being tested.

CAUTION: ADJUST THE COMPENSATOR CONTROL FOR A ZERO READING ON THE FLUID PRESSURE GAGE WHEN THE COMPENSATOR IS NOT IN USE.

(H) Open the flow control valves and proceed with the test operation as directed by the manufacturer's specifications for the system under test.

(I) Close reservoir shut-off valve.

1-46 Movement to a New Site.

(A) Shut down and disconnect the test stand from the system being tested. Coil the hose assemblies and stow them in the rear compartment of the test stand.

(B) Close and secure all doors and release the brake lever assembly.

(C) Attach the drawbar assembly to the prime mover and tow the test stand to the new work site.

CAUTION: MAXIMUM ALLOWABLE TOWING SPEED IS 20 MPH OVER SMOOTH PAVED SURFACES.

(D) Set up the test stand for operation in accordance with instructions in paragraph 1-43.

1-47 Operation Under Unusual Conditions.

1-48 Operation in Extreme Cold.

(A) Lubricate the test stand in accordance with the lubrication chart.

(B) Keep the electrolyte at the proper level in the battery, and the battery fully charged. If water is added to the battery, run the engine long enough to thoroughly charge the battery.

(C) Close engine compartment doors as required to maintain satisfactory engine operating temperature.

(D) Remove oil from the air cleaner and replace with the proper grade of oil.

1-49 Operation in Extreme Heat.

(A) Locate the test stand in a well ventilated area and keep all door assemblies open during operation.

(B) Lubricate the test stand in accordance with the lubrication chart.

(C) Keep the engine shrouding, cylinder heads, fins, and the air opening in the housing free of dirt and obstructions.

1-50 Operation in Dusty or Sandy Areas.

(A) Lubricate the test stand in accordance with the lubrication chart. Keep lubricants, grease gun, oil containers and fittings clean.

(B) Protect the test stand from dust and sand as much as possible. Keep the unit clean and free of foreign matter.

(C) Cover the unit with a tarpaulin when not in use.

(D) If possible, wet down the area surrounding the operating site to keep down dust and sand.

(E) Clean the engine air cleaner every 2 to 4 hours.

1-51 Operation Under Rainy or Humid Conditions.

(A) Lubricate the test stand in accordance with the lubricatin chart.

(B) Keep the fuel tank full to prevent accumulation of condensation.

(C) Keep electrical components clean and dry. Watch closely for evidence of fungus growth and remove promptly.

(D) Cover the test stand with a tarpaulin or similar protectior when not in use.

1-52 Operation on Salt Water Areas.

(A) Lubricate the test stand in accordance with the lubrication chart.

(B) Wipe all exposed areas frequently. Clean off salt water deposits with clear water and wipe dry.

(C) Coat all exposed machined metal surfaces with a thin film of oil.

(D) Retouch or repaint damaged paint surfaces to prevent corrosion of exposed metal.

(E) Cover the test stand with a tarpaulin or similiar protection when not in use.

1-53 Operation at High Altitude.

(A) The amount of oxygen delivered to the carburetor is reduced when operating at high altitudes. Reduce the amount of fuel admitted by the carburetor by adjusting the fuel mixture.

(B) Keep air cleaner clean to assure maximum air passage to the carburetor.

SECTION II

OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

2-1 Operator and organizational maintenance instructions.

2-2 Special Organizational Tools and Equipment. No special tools or equipment are required to perform organizational maintenance of this aircraft hydraulic test stand.

2-3 Lubrication.

2-4 General. This section contains lubrication instructions which are supplemental to and are not specifically covered in the lubrication chart.

2-5 Detailed Lubrication Information.

(A) Care of Lubricants. Replace covers on lubricant containers after use and store in a clean, dry place. Keep all containers, used in handling lubricating oil or gasoline, clean and ready for use.

(B) Cleaning. Use an approved cleaning solvent to wipe all surfaces clean surrounding the point of application before applying the lubricant.

(C) Points of Application. Follow the detailed lubrication instructions given in the applicable maintenance paragraphs and refer to the lubrication chart for type of lubricant and interval of application.

(D) Operation After Lubrication. Operate the test stand for 5 minutes immediately after lubrication. Inspect the oil filter for leaks and correct as necessary. Stop the unit, wait 5 minutes, and check the oil level. Add oil to bring the oil level up to the FULL mark if necessary.

Lubricants	Expected Temperatures			Change Intervals
	Above +32°F.	+40°F. to -10°F.	0°F. to -65°F.	
SAE 30 - MIL-L-2104 SAE 10 - MIL-L-2104 SUB ZERO - MIL-L-10295	SAE30	SAE10	ENG. OIL SUB ZERO	50 hours 50 hours
2190 LUBRICATION OIL (General Purpose)				
Flow Indicator Drawbar Assembly Door Hinges and Latches Engine Generator	2190	2110	2075	50 hours 100 hours 100 hours 100 hours
GAA GREASE, (Automotive and Artillery)				
Wheel Bearings Tie Rod Ends Spindles	ALL TEMPERATURES			100 hours 100 hours 100 hours

Table 1 Lubrication Chart

(E) Oil Filter.

(1) Loosen the bolt and remove the cover from the oil filter.

(2) Remove the cartridge from inside the filter and discard.

(3) Wipe the inside of the filter with a lint-free cloth making sure all dirt and sludge are removed.

(4) Insert a new cartridge in the filter body. Be sure the correct end of the cartridge is up.

(5) Install a new gasket in the cover. Place the cover on the oil filter and tighten the bolt.

(6) Add one quart of oil to the engine crankcase to compensate for oil lost in servicing the oil filter. Refer to lubrication chart table 1 for the proper grade oil.

(7) Operate the unit immediately after servicing.

(F) Air Cleaner.

(1) Remove the air intake cap

(2) Loosen the thumbscrew and remove the oil cup from the air cleaner assembly.

(3) Discard the oil in the oil cup. Wash the oil cup and air intake in an approved cleaning solvent and dry thoroughly.

(4) Fill the oil cup to the level mark with clean oil of the proper grade. Refer to the lubrication chart table 1. Install the oil cup on the air cleaner body and tighten the thumbscrew to secure.

(5) Install the air intake cap on the top of the air cleaner assembly.

2-6 Preventive Maintenance Services.

2-7 General. To insure that the equipment is ready for operation at all times, it must be inspected systematically before operation, during operation, and after operation, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services will be performed before operation. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed during operation which would damage the equipment if operation were continued. After-operation services will be performed by the operator after every operating period. After-operation services will be performed at intervals based on the normal operation of the equipment. Reduce interval to compensate for abnormal conditions. Defects or unsatisfactory operating characteristics beyond the scope of the operator to correct must be reported at the earliest opportunity to organizational maintenance. Responsibility for performance of preventive maintenance services rests not only with the operator, but with the entire chain of command from section chief to commanding officer (AR 750-5).

SECTION II (Con't.)

2-8 Operator's Daily Services.

Intervals			Procedures
Before Operation	During Oper.	After Oper.	
X	---	X	Visual Inspection. Make a general inspection of the entire unit for obvious deficiencies, such as oil or fuel leaks, loose or missing bolts, nuts, screws, loose connections, broken wires, and any damage that may have occurred since the equipment was last operated. Correct or report any deficiencies to field maintenance.
X	---	---	Tampering. Inspect the test stand for evidence of tampering or damage. Do not operate the unit until all defects are corrected or reported to direct and general support maintenance.
X	---	X	Fuel. Check the fuel supply. See that the fuel tank is full.
X	---	X	Leaks. Inspect for leaks, paying particular attention to the fuel line and connections. Correct all deficiences noticed or report to direct and general support maintenance.
X	---	X	Oil. Check the oil level in the engine crankcase. Add oil if the oil is not at the proper leve.
X	---	---	Air Cleaner. Inspect the air cleaner for accumulated dirt. Clean if necessary.
X	---	X	Battery. Clean the battery and see that the terminal connections are tight. Check the level of the electrolyte. Add water as necessary to bring the level to three-eights of an inch above the plates.
X	---	X	Tires. Inspect the tires for cuts, leaks, fabric breaks, and uneven wear. Check the tires for proper inflation. Correct tire pressure is 60 psi. Report a defective tire to direct and general support maintenance.

SECTION II (Con't.)

Intervals			Procedures
Before Operation	During Oper.	After Oper.	
X	---	X	Cooling System. Inspect the condition of the fins on the engine. See that they are clean and free from dust and dirt. Inspect the engine shrouding for correct installation and loose or missing mounting bolts. Correct all deficiencies or report them to direct and general support maintenance.
X	---	---	Fuel Strainer. Inspect the bowl of the strainer for accumulation of water, dirt, and foreign matter. Clean the fuel strainer if necessary
X	---	---	Instruments. Inspect all instruments for broken glass, improper operation, and insecure mounting. Report all deficiences to direct and general support maintenance.

2-9 Troubleshooting.

2-10 General. This section provides information useful in diagnosis and correction, inspection, operation, or failure of the hydraulic test stand, or any of its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause.

2-11 Engine Hard to Start or Fails to Start.

Probable cause	Possible remedy
Carburetor not choked sufficiently------	Pull choke control further out.
Carburetor flooded----------------------	Push in choke control and crank until engine fires.
Water or dirt in fuel strainer----------	Clean the fuel strainer.
Battery cables loose or terminals corroded----------------------	Tighten battery cable connections or remove and clean cables as required.

2-12 Engine Misses or Runs Erratically.

Probable cause	Possible remedy
Water, dirt, or gum in the fuel---------	Clean the fuel strainer and drain fuel tank and fill with clean fuel.
Air cleaner clogged---------------------	Service air cleaner.
Carburetor out of adjustment-----------	Report to direct and general support maintenance.

2-13 Engine Stops Suddenly.

Probable cause	Possible remedy
Water or dirt in fuel strainer----------	Clean the fuel strainer and drain the fuel tank and fill with clean fuel
Air cleaner clogged---------------------	Service the air cleaner
Hydraulic fluid temperature excessive---	Allow fluid to cool (see Para. 1-3C)

2-14 Engine Overheats.

Probable cause	Possible remedy
Crankcase oil level too low	Stop engine and add oil to proper level.
Air shroud loose or damaged	Tighten air shroud. Report damaged shroud to direct and general support maintenance.
Cylinder cooling fins clogged with dirt	Report malfunction to direct and general support maintenance.

2-15 Engine Knocks or Develops Excessive Noise.

Probable cause	Possible remedy
Crankcase oil level too low	Stop engine and add oil to proper level. Refer to lubrication chart.

2-16 Engine Oil Pressure Low.

Probable cause	Possible remedy
Crankcase oil level too low	Stop engine and add oil to proper level. Refer to lubrication chart.
Oil pressure gage defective	Report malfunction to direct and general support maintenance.

2-17 Engine Exhaust Smoky.

Probable cause	Possible remedy
Crankcase oil level too high	Drain off excess oil to correct level.
Carburetor choked excessively	Push in choke control
Engine cold causing poor cumbustion	Allow sufficient time for engine warm up before operating the hydraulic system.

2-18 Fuel Consumption Excessive.

Probable cause	Possible remedy
Choke control partially closed	Open choke control.
Dirty air cleaner	Service the air cleaner.

Probable cause	Possible remedy
Fuel leaks	Report to direct and general support maintenance.

2-19 Battery Needs Frequent Recharging.

Probable cause	Possible remedy
Battery electrolyte level low	Add battery water to correct level.
Battery defective	Replace defective battery.

2-20 Hydraulic Pump Fails to Deliver Sufficient Pressure.

Probable cause	Possible remedy
High pressure relief valve out of adjustment	Adjust the high pressure valve.
Compensator control incorrectly adjusted	Adjust the compensator control.
Fluid bypass valve open	Close the fluid bypass valve.
Defective fluid pressure gage	Report to direct and general support maintenance.
Loss of prime	Fill prime port or pump.

2-21 Hydraulic Pump Fails to Deliver Sufficient Volume.

Probable cause	Possible remedy
Fluid volume control incorrectly adjusted	Adjust the fluid control
Engine speed incorrect	Set throttle for an indicated 2150 rpm.
Air in hydraulic system	Bleed air from hydraulic system (Par. 2-26).

2-22 Hydraulic System Pressure too High.

Probable cause	Possible remedy
High pressure relief valve set too high	Adjust high pressure relief valve

Probable cause	Possible remedy
High pressure relief valve defective	Refer the malfunction to direct and general support maintenance.

2-23 Hydraulic Fluid Temperature too High.

Probable cause	Possible remedy
Low pressure filter dirty	Report deficiency to direct and general support maintenance.
Reservoir fluid level low	Fill reservoir to correct level.

2-24 Hydraulic system.

2-25 General. The hydraulic system of the test stand is comprised of the hydraulic pump, high and low pressure filters, pressure gages, flow indicator, and control valves. The necessary interconnecting hose assemblies and tubing are included for the hydraulic system to perform its intended function of delivering filtered hydraulic fluid at the desired volume and pressure, to the air craft hydraulic system under test.

(A) Maintenance

The hydraulic system of the test stand must at all times be free of leaks. The efficiency of the test stand will be impaired if a leak exists anywhere in the system.

(B) Component Removal

In the event that a component in the hydraulic system is removed, all openings must be capped or plugged to prevent entrance of foreign matter to the system.

2-26 Bleeding Air From the Hydraulic System.

(A) Fill the reservoir with MIL-H-5606 fluid.

(B) Open the bleed valve and allow air to escape from the low pressure filter. Close the valve when air bubbles no longer appear.

(C) Connect the ½ inch hose assembly to the coupling half.

(D) Set the outlet selector valve in the ½ inch outlet position.

(E) Open the flow control valve.

(F) Remove the reservoir fill cap. Remove the coupling half from the opposite end of the attached ½ inch hose assembly and insert the open end into the reservoir being careful not to damage the screen in the filler neck of the reservoir.

(G) Set the fluid volume control at 2 GPM as registered on the fluid flow indicator.

(H) Start the test stand and circulate hydraulic fluid through the system and back into the reservoir until all traces of air bubbles are gone from the fluid flowing into the reservoir.

(I) Stop the test stand and disconnect the hose assembly. Cap both ends of the hose assembly and the coupling half of the test stand.

2-27 Filter Element Replacements.

(A) The high pressure filter and the low pressure filter are protected with differential pressure switches which, when the pressure drop across the filter reaches a value at which change of the filter element is required, illuminates a red warning light on the control panel.

CAUTION: After every replacement of the low pressure filter element, the hydraulic system must be bled of air (Para. 2-26).

2-28 Hose Assemblies.

(A) Removal

(1) Drain reservoir.

(2) Disconnect and remove hose from pressure regulator valve to low pressure filter manifold.

(B) (1) Drain low pressure filter.

(2) Disconnect and remove hose from low pressure filter to pump header.

(C) Remove the 3 hose assemblies attached to the 3 coupling halves. These hose assemblies are stored in the compartment at the rear of the test stand when not in use.

2-29 Cleaning and Inspection.

(A) Clean the hose assemblies in an approved cleaning solvent and dry throughly.

(B) Inspect the hose assemblies for frayed or worn hose. Inspect the fittings of the hose assemblies and the drain assembly for damaged threads. Replace a defective hose assembly or drain assembly.

2-30 Pressure Gages.

(A) Testing Pressure Gages

(1) Connect a pressure gage of known accuracy to the filter pressure gage tap.

(2) Start the test stand and compare the readings of both the test gage and the filter pressure gage. Replace a defective gage if necessary.

SECTION III

3-1 Direct and General Support Maintenance Instructions.

3-2 Special Direct and General Support Maintenance Tools and Equipment. No special tools are required to perform direct and general support maintenance of this hydraulic test stand.

3-3 Preventive Maintenance Services.

3-4 General. Preventive maintenance is performed by direct and general support maintenance personnel at 50 and 100 hour intervals. The preventive maintenance services to be performed at these regular intervals are listed in paragraph 3-5. The first column headed "inspection", is provided for the information of the person performing the inspection. An X in this column indicates that an inspection should be made of the listed items in accordance with instructions given in the text opposite. The indicated items and instructions constitute minimum inspection requirements for the equipment.

3-5 Direct and General Support Preventive Maintenance Services.

Inspection	50 hour	100 hour	GENERAL
X	X	X	Before-operation services. Perform the services listed in daily before-operation services (par.2-8)
X	X	X	Lubrication. Inspect for missing or damaged lubrication fittings and inspect for indications of improper lubrication. Inspect lubricant level in engine crankcase. Inspect for oil and grease leaks; also inspect for defective or damaged oil seals.
	X	X	Lubricate as necessary in accordance with the lubrication chart. Replace missing or damaged fittings. Correct all oil or grease leaks.
X	X	X	Appearance. Inspect the general appearance of the equipment, paying particular attention to cleanness, legibility of identification markings, and conditions of the paint. Correct all deficiences noticed.

Inspection	50 hour	100 hour	GENERAL
X	X	X	Cylinder heads, manifold, and muffler. Inspect the cylinder heads, manifolds and muffler for leaks, loose mounting and defective gaskets. Tighten loose manifolds and muffler mounting bolts and nuts. During the first weekly servicing of a new or reconditioned engine, inspect all the cylinder head bolts for tightness. After warming engine up to operating temperature, tighten any loose bolts to 25 to 32 ft-lb torque. Replace defective cylinder head and manifold gaskets.
X	X	X	Valve mechanism. If the valves are noisy or loss of power is noticed, inspect the condition of the valve mechanism.
	X	X	Remove valves covers and adjust valve lifter clearance if necessary. The correct clearance for the valve lifters is 0.0080 inch for the intake valves and 0.0160 inch for the exhaust valves. Replace cover gaskets if defective.
X		X	Compression Test. Remove the spark plugs and test the cylinder compression by turning the engine over several times to stabilize gage reading. If the gage reading varies more than 10 pounds between the four cylinders, inspect the cylinder head bolts for tightness.
		X	Tighten any loose bolts and retest. If low compression or a variation in compression persists, the trouble lies with the cylinder head gasket, valves, or piston rings. Correct all deficiencies.
X	X	X	Electrical system magneto. Inspect the ignition magneto for loose mounting bolts and wiring connections. Correct any deficiencies noted.
	X	X	Remove the end cap and inspect the distributor cap for cracks, and corroded terminals. Examine the breaker point gap. The correct gap is 0.015 inch at full separation of points.
X	X	X	Spark plugs. Inspect the spark plugs for looseness, bad connections, and dirty or broken insulators.
	X	X	Replace damaged spark plugs. Clean dirty plugs and set the gap to 0.0300 inch.

SECTION III (Con't.)

Inspection	50 hour	100 hour	GENERAL
X	X	X	Generator and starter. Inspect the mounting of the generator and starting motor for loose connections. Examine the brushes, brush holders and springs. Inspect the commutators for dirt and scoring.
	X	X	Tighten loose mounting bolts. Replace generator brushes worn to one half their original length. Replace starter brushes worn to one half their original length.
X	X	X	Engine generator regulator. Inspect the generator for proper operation, tight connections, and secure mounting. The generator regulator should allow an appreciable charge to go into the battery after the starter is used. After the battery is fully charged, the ammeter should read only a slight charge.
	X	X	Tighten loose mounting nuts and connections. Adjust or replace a defective engine generator regulator.
			CONTROL PANEL
X	X	X	Gages. Examine the condition of all gages. See that all gages indicate correctly and that the glass is not cracked or broken.
	X	X	Tighten loose mounting screws and connections. Replace any defective or damaged gage.
X	X	X	Meters. See that all meters are securely mounted and operating properly and that the glass is not cracked or the indicators are not bent or broken.
	X	X	Tighten loose mounting screws and replace any defective or damaged meter.
X	X	X	Control valves. Inspect all control valves for packing leaks and proper operation. See that handwheels are securely mounted.
	X	X	Tighten packing or replace as required. Replace a defective or damaged control valve.

RUNNING GEAR

Inspect-ion	50 hour	100 hour	
X	X	X	Tires. Inspect all tires for under inflation, abnormal or uneven wear, cuts, embedded foreign matter, and missing valve caps.
	X	X	Remove any foreign matter from tires. See that tires are inflated to correct pressure and all valve caps are in place.
X	X	X	Wheels. Inspect for loose wheel mounting bolts. Inspect wheel bearings for proper adjustment.
	X	X	Tighten loose wheel bolts and adjust wheel bearings as required
X	X	X	Axles. Inspect the axle assemblies for secure mounting and proper alinement. Inspect the springs for cracks, breaks and weakened condition.
	X	X	Tighten all axle mounting bolts. Aline the front wheels as required. Replace defective springs.
X	X	X	Brake assembly. Inspect the brake assembly for correct adjustment. Inspect the cables for secure mounting.
	X	X	Tighten all brake assembly mounting bolts and adjust the brakes.

HYDRAULIC SYSTEM

Inspect-ion	50 hour	100 hour	
X	X	X	Hydraulic pump. Inspect the hydraulic pump for loose mounting bolts and hydraulic connections. See that the drive coupling is securely mounted and alined.
	X	X	Tighten all mounting bolts and loose or leaking connections. Replace a defective drive coupling.
X	X	X	Hose assemblies. Inspect the hydraulic hose assemblies for loose connections. Inspect the hose for cracks, breaks, and for frayed or rotten fabric covering.
	X	X	Tighten hose connections and replace any defective hose assembly.
X	X	X	Tubing. Inspect all tubing for cracks, breaks, and distortion,

Inspection	50 hour	100 hour	HYDRAULIC SYSTEM
	X	X	Tighten all tube connections. Replace any damaged or defective tube or fitting.
X	X	X	High Pressure filter assembly. Inspect the filter for dirty or clogged condition resulting in excessive pressure drop.
	X	X	Remove and replace the filter element.
X	X	X	Thermoswitch. Inspect the thermoswitch for correct temperature response and for secure installation.
	X	X	Replace a defective or damaged thermoswitch.

3-6 Troubleshooting.

3-7 General. This section provides information useful in diagnosis and correction, inspection, operation, or failure of the hydraulic test stand, or any of its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause.

3-8 Engine Hard to Start or Fails to Start.

Probable cause	Possible remedy
Battery defective	Charge or replace defective battery
Choking insufficient	Inspect the choke valve for full open or closed position.
Battery cables loose on terminals	Tighten loose connections.
Ignition switch faulty	Replace switch
Battery cable loose on armature relay	Tighten loose connections.
Carburetor flooded	Remove spark plugs and crank the engine several times to drive out rich fuel mixture.
No ignition spark	Test the spark

SECTION III (Con't.)

Probable cause	Possible remedy
Spark plugs defective	Clean and adjust or replace spark plugs.
Magneto faulty	Repair or replace magneto contact point set.

3-9 Engine Misses or Runs Erratically.

Probable cause	Possible remedy
Carburetor gasket leaks	Tighten carburetor mounting bolts. Replace gasket if leak persists.
Spark weak	Test spark
Spark gap incorrect	Measure and reset spark plug gap.
Ignition wiring loose	Tighten ignition wire connections.
Magneto contact points pitted or incorrectly adjusted	Clean, adjust, or replace contact points.
Governor defective	Repair governor

3-10 Engine Stops Suddenly.

Probable cause	Possible remedy
Fuel pump defective	Repair or replace fuel pump.
Fuel line clogged	Remove and clean fuel line, replace if defective.
Magneto contact set defective	Replace defective contact set.
Hydraulic fluid temperature excessive	Allow fluid to cool.

3-11 Engine Overheats.

Probable cause	Possible remedy
Cylinder cooling fins dirty	Clean dust and dirt from cooling fins.
Magneto timed late	Time the magneto.
Air shroud partially removed from engine	Install the missing shroud

3-12 Engine Knocks or Develops Excessive Noise.

Probable cause	Possible remedy
Magneto timing advanced too far	Time the magneto.

Probable cause	Possible remedy
Carbon deposits on cylinder heads	Remove and clean cylinder heads.
Flywheel loose	Tighten the flywheel.

3-13 Engine Exhaust Smoky.

Probable cause	Possible remedy
Carburetor incorrectly adjusted	Adjust the carburetor
Carburetor defective	Repair or replace carburetor.

3-14 Engine Starter Fails to Operate.

Probable cause	Possible remedy
Ignition fuse blown	Replace ignition fuse.
Starter brushes worn	Replace brushes.
Electrical connections loose or corroded	Tighten connections or replace wiring.
Starter switch contacts burned	Replace starter switch.
Starter brushes defective	Replace starter brushes.

3-15 Fuel Consumption Excessive.

Probable cause	Possible remedy
Carburetor incorrectly adjusted	Adjust the carburetor
Fuel tank leaking	Repair or replace fuel tank
Carburetor defective	Repair or replace carburetor.

3-16 Ammeter Shows No Charge or Discharge With Engine Operating.

Probable cause	Possible remedy
Electrical Connections loose or corroded	Clean and tighten electrical connections.
Generator regulator incorrectly adjusted or faulty	Replace generator regulator as required.
Generator V-belt loose or broken	Adjust or replace V-belt as necessary.
Generator inoperative	Replace worn brushes.
Ammeter defective	Replace ammeter.

SECTION III (Con't.)

3-17 Ammeter Shows Excessive Charge.

Probable cause	Possible remedy
Battery run down	Charge battery
Generator regulator defective	Replace a defective regulator
Generator field winding grounded	Replace generator.

3-18 Ammeter Needle Fluctuates Rapidly.

Probable cause	Possible remedy
Electrical connections shorted or loose	Repair short circuits and tighten loose connections
Generator commutator has high mica	Report to depot maintenance.

3-19 Wheel Wobbles.

Probable cause	Possible remedy
Wheel bent	Replace the wheel.
Wheel loose on the hub	Tighten wheel mounting bolts.
Wheel bearings incorrectly adjusted	Adjust wheel bearing.

3-20 Wheel Bearings Overheat.

Probable cause	Possible remedy
Wheel bearings lack lubrication	Lubricate wheel bearings.
Wheel bearings incorrectly adjusted	Adjust wheel bearings.

3-21 Tire Wear Abnormal or uneven.

Probable cause	Possible remedy
Wheel loose on the hub	Tighten wheel mounting bolts.
Steering tie rod incorrectly adjusted	Adjust tie rods.

3-22 Brake Does Not Hold.

Probable cause	Possible remedy
Normal wear	Adjust brakes.
Defective brake assembly	Repair or replace brake assembly.

3-23 Hydraulic Pump Fails to Deliver Sufficient Pressure.

Probable cause	Possible remedy
Defective high pressure relief valve	Repair or replace high pressure relief valve.
Fluid pressure gage defective	Replace fluid pressure gage
Compensator control defective	Repair or replace compensator control.
Hydraulic pump defective	Replace the pump.
Loss of prime	Fill prime port on pump.

3-24 Hydraulic Pump Fails to Deliver Sufficient Volume.

Probable cause	Possible remedy
Fluid volume control defective	Repair fluid volume control.
Air in the hydraulic system	Bleed air from the system.
Engine speed too low	Check engine with hand speed indicator. Replace tachometer if defective.
Fluid flow indicator defective	Replace or repair fluid flow indicator.
High pressure filter clogged	Replace high pressure filter.
Fluid bypass valve leaking	Replace fluid bypass valve.

3-25 Hydraulic System Pressure Too High.

Probable cause	Possible remedy
High pressure filter clogged	Replace high pressure filter.
High pressure relief valve defective	Repair or replace high pressure relief valve.
Compensator control defective	Repair or replace compensator control.
Fluid pressure gage defective	Repair or replace fluid pressure gage.

3-26 Hydraulic Fluid Temperature Too High.

Probable cause	Possible remedy
Fluid temperature gage defective	Replace fluid temperature gage.

Probable cause	Possible remedy
High pressure filter clogged	Replace high pressure filter
Thermoswitch defective	Replace the thermo-switch.

3-27 Radio Interference Suppression.

3-28 Definition.

(A) Interference. The term "interference" as used herein applies to electrical disturbances in the radio frequency range which are generated by the test stand and which may interfere with the proper operation of radio receivers or other electronic equipment.

(B) Interference Suppression. The term "interference suppression" as used herein applies to the methods used to eliminate or effectively reduce radio interference generated by the test stand.

3-29 Purpose of Interference Suppression. The tactical importance of effective interference suppression cannot be stressed too greatly. Since the electrical disturbances generated by the test stand are composed partly of electrical waves in the radio frequency range they must be suppressed for two important reasons. First, they will interfere with the proper operation of the friendly radio net, and second, they will enable the enemy to locate the equipment and its associated units.

3-30 General Sources of Interference. Generally, radio interference is generated anywhere a spark occurs or where a high-frequency current is present. A spark is a small amount of current jumping an air gap in response to the force of a relatively high voltage. The gasoline engine ignition system is a common source. Magneto breaker points, generator commutators, relay contacts, and static changes collecting on the frame are other ocmmon sources which in some way must be suppressed.

3-31 General Methods Used to Attain Proper Suppression. Essentially suppression is attained by providing a low-resistance path to ground for the stray currents. The method used to attain suppression include shielding the ignition and high-frequency wires, grounding the frame with bonding straps, and using capacitors and resistors where necessary.

3-32 Interference Suppression Components.

(A) A 0.5 MF (Micro Farad) capacitor is mounted on battery terminal of regulator.

(B) A 0.5 MF (Micro Farad) capacitor is mounted on generator terminal of generator.

(C) A wave trap is mounted on field terminal of generator.

(D) Regulator and rear half of generator are encased in metal housing.

(E) Generator is grounded directly to chasis by means of a ground strap attached from generator ground screw to ground bolt.

(F) Test stand is grounded directly to positive ground by means of ground bolt located on chasis just forward of hose connectors.

3-33 Testing Radio Interference Suppression Components. Test the capacitors for leaks and shorts on a capacitor tester. Replace a defective capacitor. If test equipment is not available and interference is indicated, isolate the cause of interference by trial and error method or replace each capacitor in turn until the cause of interference is determined and eliminated.

CTION IV

4-1 Engine Maintenance Instructions.

4-2 Engine Accessories

General. The engine accessories consist of the ignition magneto, electrical engine starter, generator and generator regulator.

4-4 Magneto. The magneto is a flange-mounted type. A permanent magnet, mounted on the rotor shaft produces a high voltage current as its field passes through a fixed coil. The current produced is fed to the spark plugs at the proper instant by a distributor.

4-5 Electrical Engine Starter. The electrical engine starter is a 12-volt, 4 brush, bendix-drive type. The starter converts electrical energy from the battery into mechanical power and transmits this power to the engine flywheel for electrical starting.

Cleaning and Inspection

(1) Clean the external surfaces of the starter with a cloth dampened in an approved cleaning solvent and dry throughly. Clean corrosion from the electrical terminal of the starter.

(2) Inspect the terminal of the starter for corrosion and damaged threads.

(3) Remove the brush access cover and inspect the starter internally for damage. Inspect the brushes for oil soaked condition and excessive wear. If the brushes are less than half their original length replace the brushes. Refer a defective starter to depot maintenance for overhaul.

4-6 Generator. The engine accessory generator is a 12-volt shunt wound, 2 brush, belt-driven, direct-current generator used to supply rrent for charging the 12-volt battery of the test stand.

Cleaning and Inspection and Repair

(1) Clean the outside of the generator with a cloth dampened with an approved cleaning solvent and dry throroughly. Clean all other metal parts in an approved solvent and dry with a lint-free cloth.

(2) Inspect the terminal studs for corrosion. Remove all corrosion and apply a thin film of grease.

(3) Inspect the brushes through the holes in the end bell. Replace brushes that are oil soaked or worn to less than half their original length.

(4) Inspect the pulley and fan for cracks, breaks, and distortion. Straighten a bent or distorted pulley and fan. Replace a pulley or fan damaged beyond repair.

(5) Inspect all attaching hardware for distortion and damaged threads. Replace if defective.

4-7 Generator Regulator. The generator regulator is a 12-volt unit provided to control the charging current from the generator to the battery.

(A) On-Engine Testing. Defects in the generator or regulator are indicated on the ammeter by a continuous high-charging rate when the battery is fully charged, or by a low or no-charging rate when the battery is low.

(1) When a high charging rate is indicated, run the engine at operating speed and disconnect the lead from the field terminal. If the output remains high the trouble is in the generator. Replace or repair a defective generator. If the output drops off, the

trouble is in the regulator. Replace a defective regulator.

(2) When a low or no charging rate is indicated, inspect for loose connections, frayed or damaged wires, or a defective battery. If none of these conditions exist, operate the engine at medium speed and momentarily ground the field terminal of the regulator. No increase indicates a defect in the generator. Repair or replace a defective generator. An increase indicated the regulator is faulty. Replace a defective regulator.

SECTION V

REPAIR PARTS LIST (ILLUSTRATED)

5-1. Introduction

5-2. This parts breakdown lists and illustrates the assemblies and detail parts which comprise the unit. The list is constructed as follows:

(A) Figure and Index number Column.

In this column the number preceding the dash refers to the number of the figure in which the part is illustrated. The number following the dash is the index number which identifies the part in the illustration.

(B) Part Number of Column.

All the part numbers in this column refer to the actual vendor (vendor code appears parenthetically after the description) except Government Standard Parts. The code symbol for all vendors (including Government Standard sources) are listed in vendor code list.

(C) Description of Column.

This column describes each assembly, subassembly, detail part and attaching part of the unit

(D) Units Per Assembly Column.

This column lists the number of units per assembly or subassembly required for one major assembly, minor assembly or subassembly respectively.

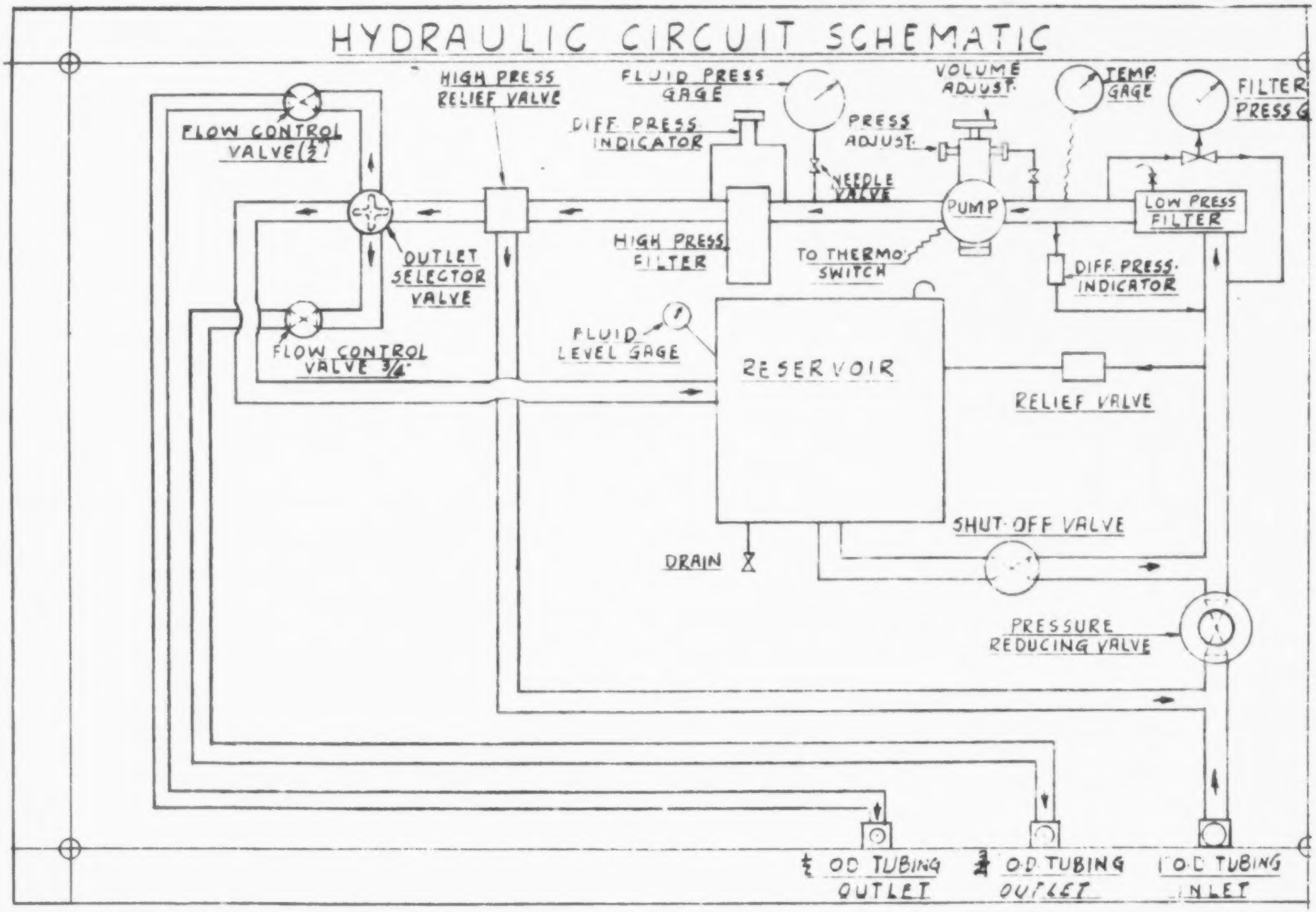

HYDRAULIC CIRCUIT SCHEMATIC
HIGH PRESS RELIEF VALVE
FLUID PRESS GAGE
VOLUME ADJUST
TEMP. GAGE
FILTER PRESS G
DIFF. PRESS INDICATOR
PRESS ADJUST
NEEDLE VALVE
PUMP
LOW PRESS FILTER
FLOW CONTROL VALVE (1/2")
OUTLET SELECTOR VALVE
HIGH PRESS FILTER
TO THERMO SWITCH
DIFF. PRESS. INDICATOR
FLOW CONTROL VALVE 3/4"
FLUID LEVEL GAGE
RESERVOIR
RELIEF VALVE
SHUT-OFF VALVE
DRAIN
PRESSURE REDUCING VALVE
1/2 OD TUBING OUTLET
3/4 O.D. TUBING OUTLET
1 O.D. TUBING INLET

Figure 10

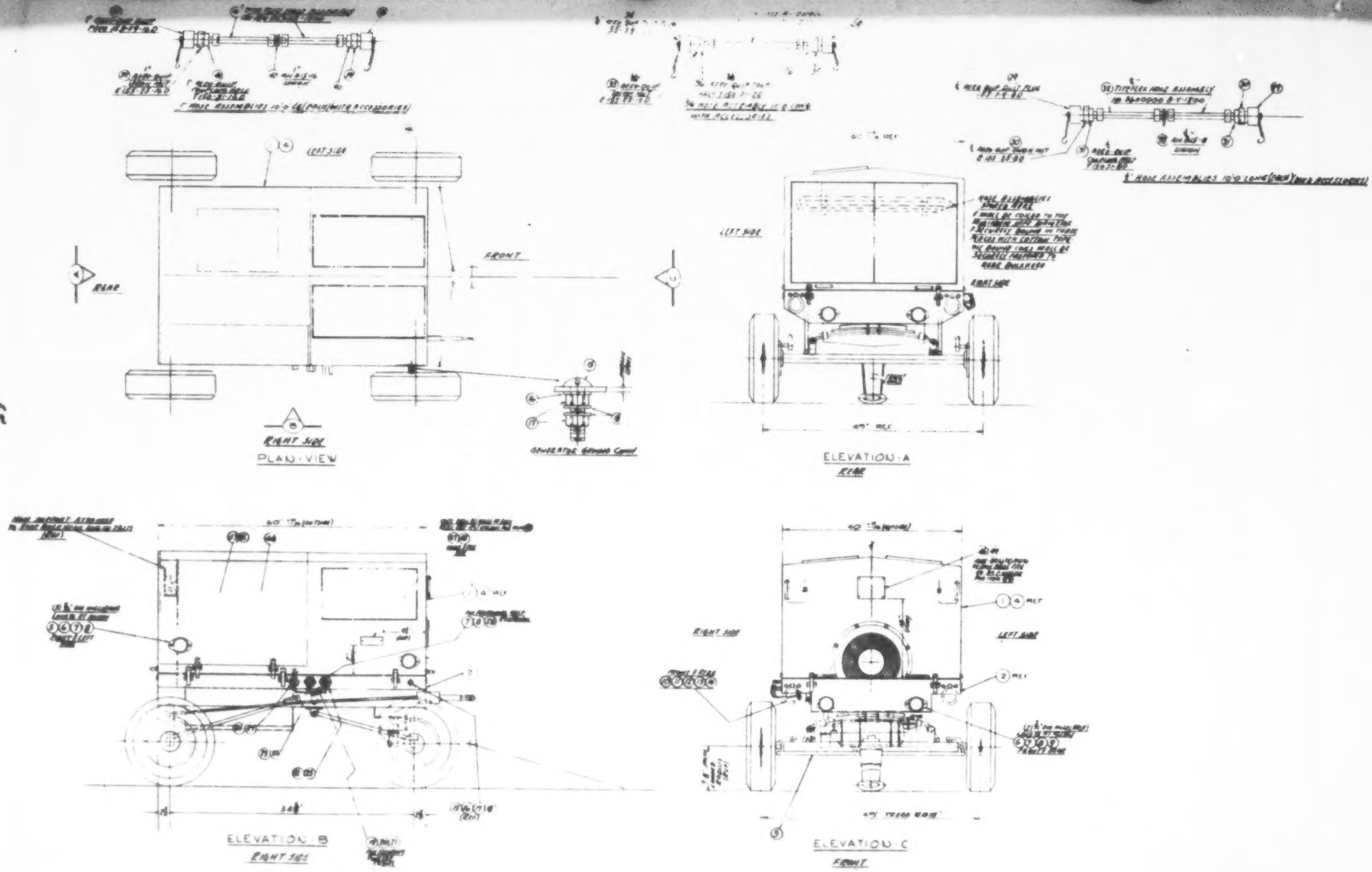

PLAN-VIEW
RIGHT SIDE
LEFT SIDE
FRONT
REAR
GENERATOR GROUND CABLE
ELEVATION-A
REAR
ELEVATION-B
RIGHT SIDE
ELEVATION-C
FRONT
LEFT SIDE
RIGHT SIDE
TIPFLEX HOSE ASSEMBLY
UNION

Figure 11

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
11-	TE6759	Test Stand Hydraulic System Gasoline Engine Driven Type D-5B Main Assembly	31682	1.
-1	28595	Housing Assembly (See Fig. 12-12A- & 12B)	31682	1.
-2	28392	Chassis Assembly No. (1) & (2) (See Fig. 13 & 14)	31682	1.
-3	28371	Undercarriage Assembly (See Fig. 15)	31682	1.
-5	PM 460-A	Reflector - 3" Steel (Peterson) (Amber)	31682	4.
-6	Commercial	10-24 x 3/4" Lg Pan Head Cap Screw (Cad-Plate)		16.
-7	Commercial	#10 STD Flat Washer (Cad-Plate)		34.
-8	21FK-1024	Flex Loc Nut	56878	34.
-9	PM 460-R	Reflector 3" Steel (Peterson) (Red)	31682	4.
-10	54B6236	Tie Down Ring Plate Nut Ordinance 54B6236	98750	4.
-11	48B7796	Tie Down Rings Ordinance 48B7796	98750	4.
-12	Commercial	3/8 - 16 x 1" Lg Hex Machine Screw (Cad-Plate)		8.
-13	Commercial	3/8" Flat Machine Screw Washer 1/16" THK x 7/8" OD (Cad-Plate)		8.
-14	21FAF-616	Flex Loc Nut	56878	8.
-15	Commercial	3/8 - 16 x 1½" Lg Brass Round HD Machine Screw		1.
-16	AN935-6166	Lock Spring Washer	88044	1.
-17	Commercial	3/8-16 Brass Nut		2.
-18	AN960-B616	Brass Flat Washer .063" THK x 5/8" OD	88044	2.
-19	Commercial	¼ - 20 x 3/4" Lg Hex HD Machine Bolt (Cad-Plate)		1.
-20	Commercial	Machine Screw Flat Washer for ¼" Bolt 3/64" THK x 17/64 ID x 9/16 OD		2.
-21	21FA-420	Flex Loc Nut	56878	1.
-22	TA-155-S4-16D	1" Coupling Half	00624	1.
-23	TA-155-S4-12D	3/4" Coupling Half	00624	1.
-24	TB-155-S4-8D	½" Coupling Half	00624	1.
-25	155-S7-16D	1" Dust Cap	00624	1.
-26	155-S7-12D	3/4" Dust Cap	00624	1.
-27	155-S7-8D	½" Dust Cap	00624	1.
-28	Commercial	10-24 x ½" Lg Fillister HD Slotted Machine Screw (Cad-Plate)		18.
-29	155-S9-8D	½" Dust Plug	00624	2.
-30	E-155-258D	½" Union Nut	00624	2.
-31	T-150-S1-8D	½" Coupling Half	00624	2.
-32	3600000-8V-1200	½" Hose Assembly	78570	2.
-33	AN 815-8	½" Union	88044	1.
-34	155-S9-12D	3/4" Dust Plug	00624	2.

Fig & Index No.	Part No.	Description	Vendor	Qty/ Assy.
11-35	155-S9-12D	3/4" Union Nut	00624	2.
-36	E-155-25-12D	3/4" Coupling Half	00624	2.
-37	3600000-12V-1200	3/4" Hose Assembly	78570	1.
-38	155-S9-16D	1" Dust Plug	00624	2.
-39	E155-25-16D	1" Union Nut	00624	2.
-40	T150-S1-16D	1" Coupling Half	00624	2.
-41	130S5-368-1200	1" Hose Assembly	78570	2.
-42	AN 815-16	1" Union	88044	1.
-43	28598	Hydraulic Piping Diagram (See Fig. 16)	31682	1.
-44	28646	Wiring Electrical Schematic (See Fig. 20)	31682	1.
-45	28635	Hydraulic Piping Layout (See Fig. Ncs. 17-18 & 19)	31682	1.
-46	28638-1	Identification Plate	31682	1.
-47	28638-2	Warning Plate	31682	1.
-48	Commercial	2-56 x ¼" Lg Pan Hd Slotted PK Self Tapping Screw (Cad-Plate)		2.
-49	Commercial	2-56 x 1/8" Lg Pan Hd Slotted PK Self Tapping Screw (Cad-Plate)		4.

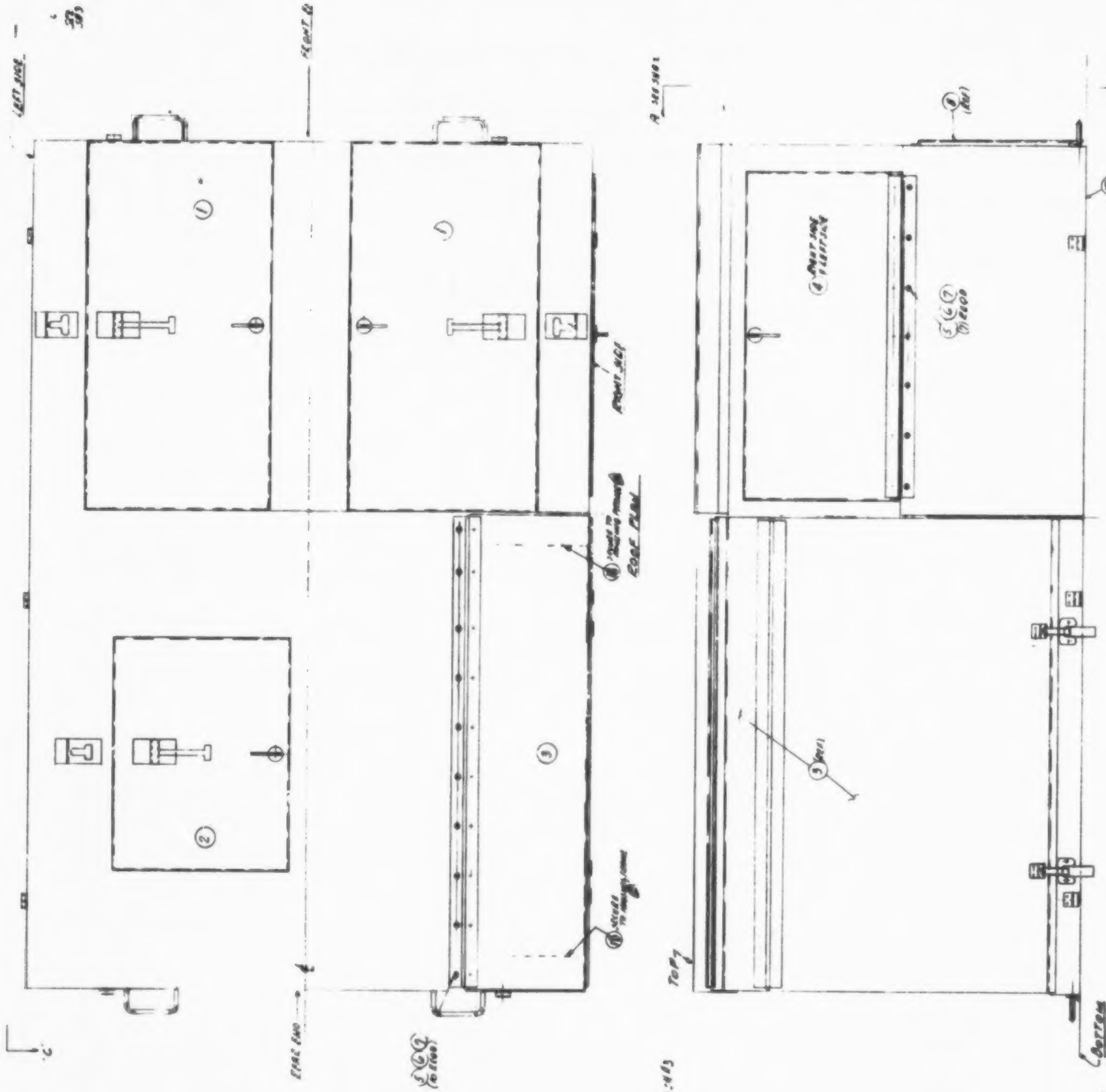
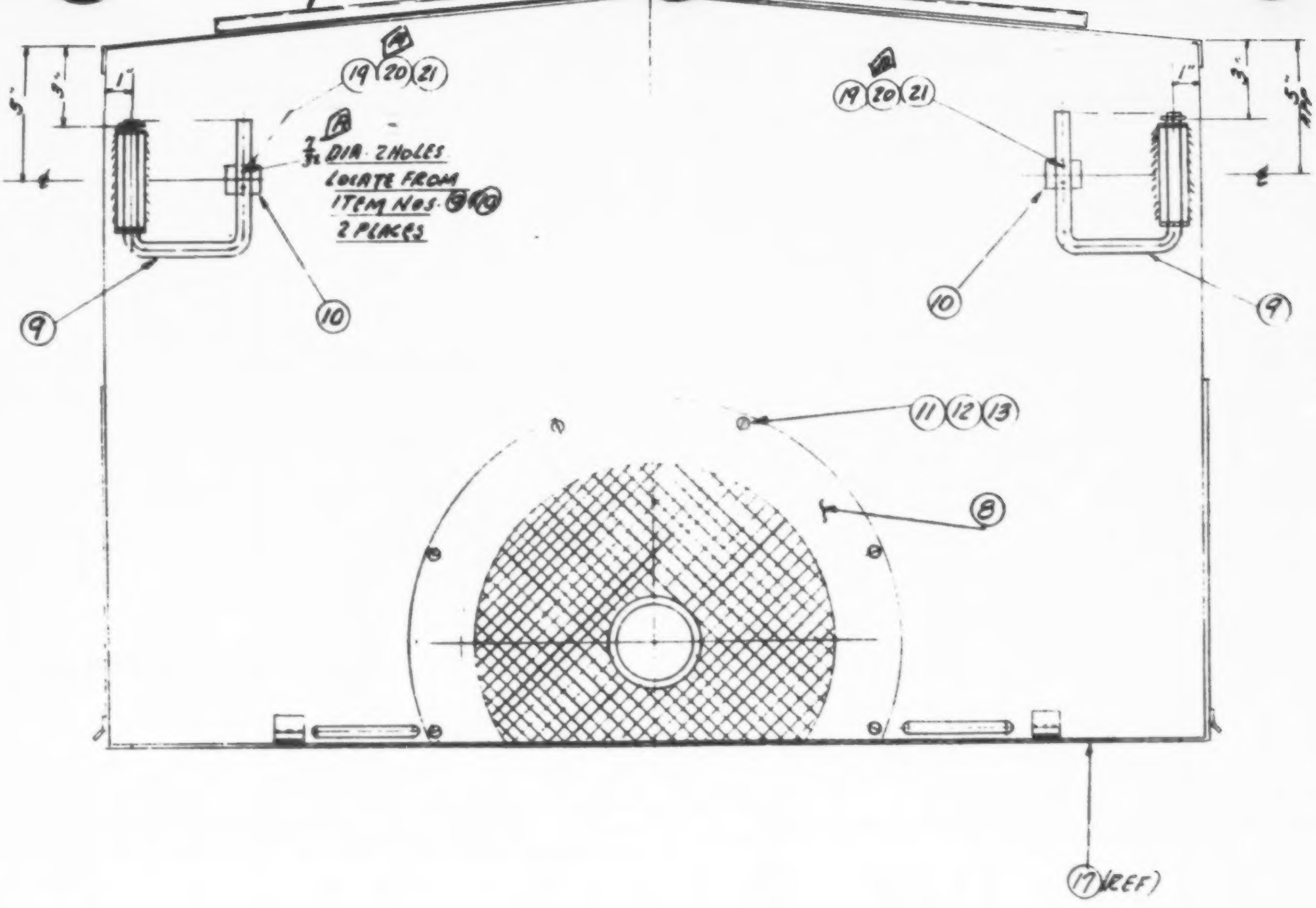
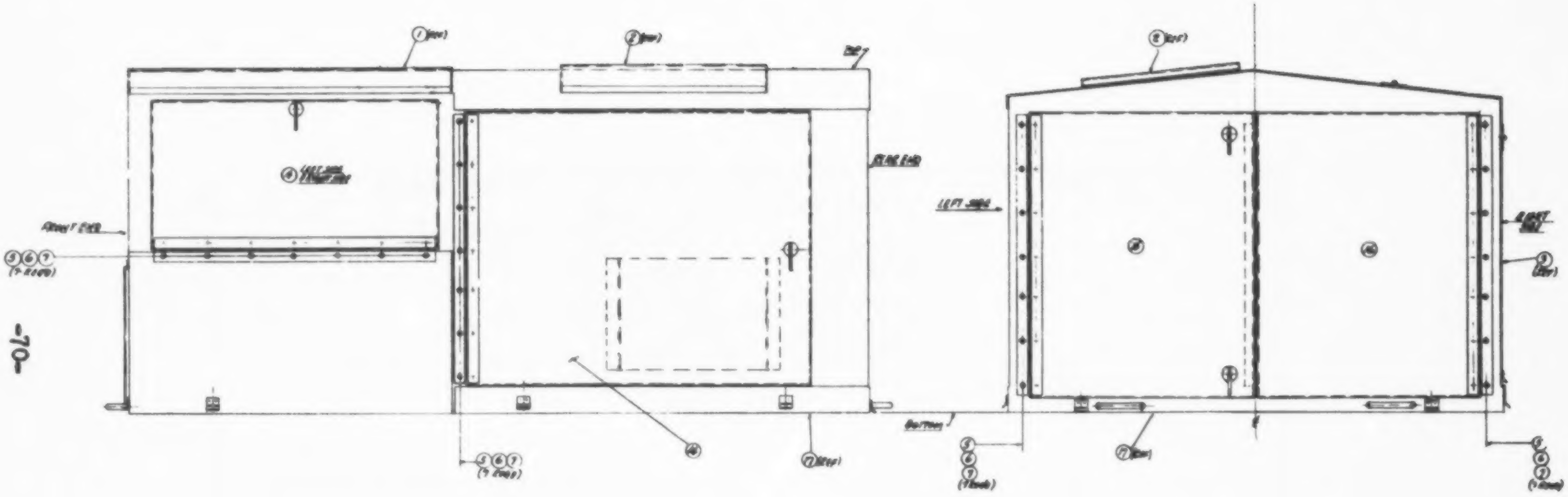

LEFT SIDE
FRONT
FRONT SIDE
ROOF PLAN
REAR END
TOP
BOTTOM
RIGHT SIDE ELEVATION
1
2
3
4
5
6
7
11

Figure 12


19 20 21
DIA. 2 HOLES
LOCATE FROM
ITEM NOS.
2 PLACES
1"
3"
5"
9
10
11 12 13
8
17 (REF)

A-A' FRONT ELEVATION
FROM SH NO 1.

Figure 12-A


TOP
REAR END
FRONT END
LEFT SIDE
RIGHT SIDE
BOTTOM
5 6 7
4
8

C-C' LEFT SIDE ELEVATION (FROM SH #1)

B-B' REAR ELEVATION FROM SH NO 1

Figure 12-B

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
12 - 12A- 12B-	28595	Housing Assembly	31682	1.
-1	28591-1	Engine Overhead Access Door Assembly (See Fig. 21)	31682	2.
-2	28591-2	Fluid Tank Overhead Access Door Assembly (See Fig. 21)	31682	1.
-3	28590-1	Control Panel Access Door Assembly (See Fig. 22)	31682	1.
-4	28592-1	Engine Access Side Door Assembly (See Fig. 23)	31682	2.
-5	Commercial	8-32 x ½" Lg Pan Head Slotted Machine Screw (Cad-Plate)		45.
-6	AN 960-8	Flat Washer (.032" Thk x 3/8" OD)	88044	45.
-7	21-FA-832	Flex Loc Nut	56878	45.
-8	28475	Air Intake Screen	31682	1.
-9	28530-1	Exterior Hose Bracket Assy.	31682	2.
-10	Hold all No.1	Clip (Stainless Steel)	31682	2.
-11	Commercial	¼ - 20 x ½" Lg Hd slotted Machine Screw (Cad-Plate)		6.
-12	AN 960-416	Flat Washer (.065" Thk x ½" OD)	88044	6.
-13	21FA-420	Flex Loc Nut	56878	6.
-14	28592-2	Fuel Tank Assembly Door Assembly (See Fig. 23)	31682	1.
-15	28593-1	Rear Access Door Assembly (Left Side) (See Fig.24)	31682	1.
-16	28593-2	Rear Access Door Assembly (Right Side) (See Fig. 24)	31682	1.
-17	28586	Housing Frame Assembly (See Fig. 25-25A & 25B)	31682	1.
-18	Commercial	1/32" Thk x 2¼" wide x 9" Lg. each (Neoprene Rubber)		2.
-19	Commercial	10-24 x 7/16" Lg Pan Head Slotted Machine Screen (Cad-Plate)		4.
-20	21FA-1024	Flex Loc Nuts	56878	4.
-21	AN 960-10	Flat Washer (.063" Thk x .438 OD)	88044	4.

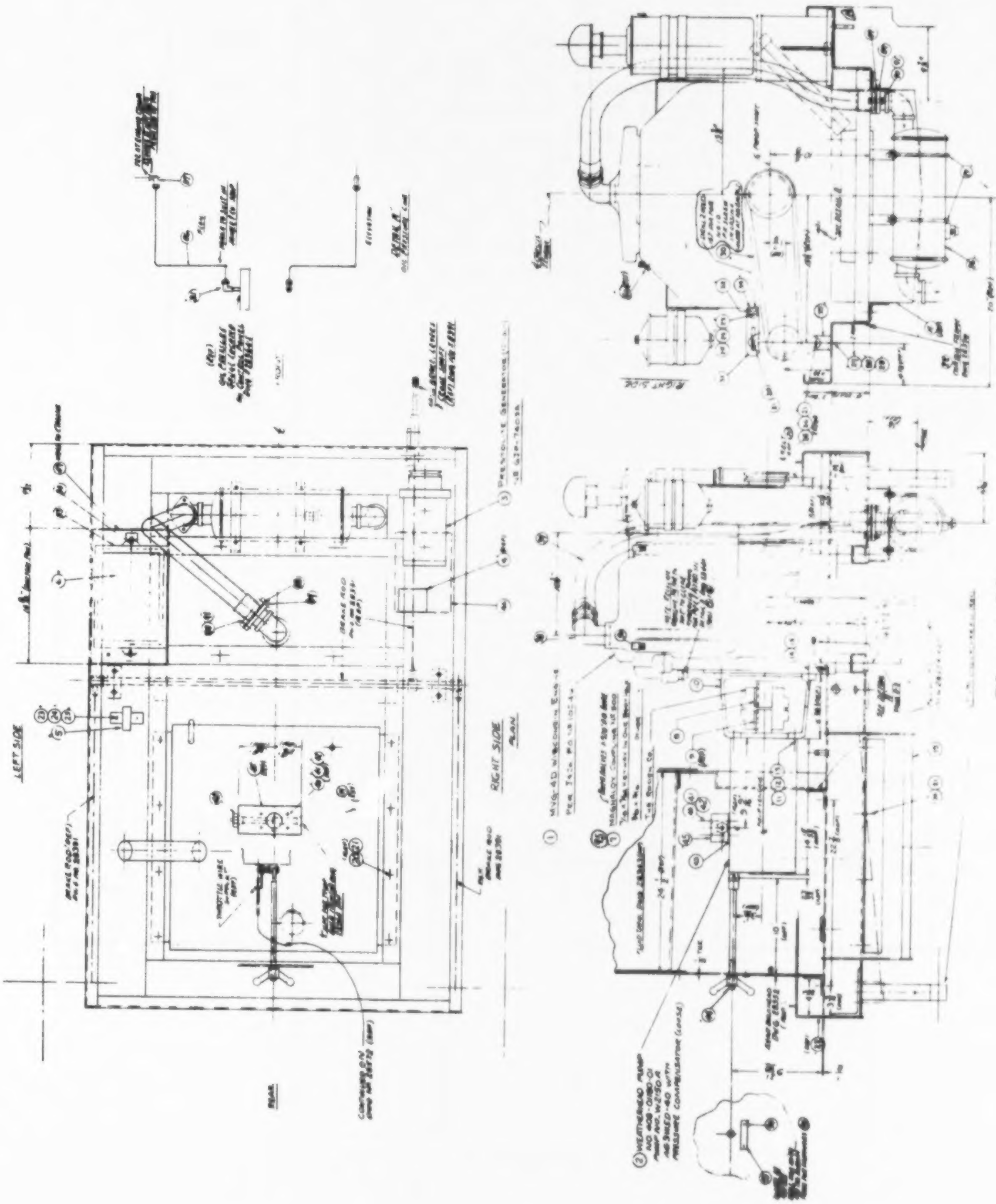

LEFT SIDE
RIGHT SIDE
PLAN
REAR
RIGHT SIDE
DETAIL A

Figure 13

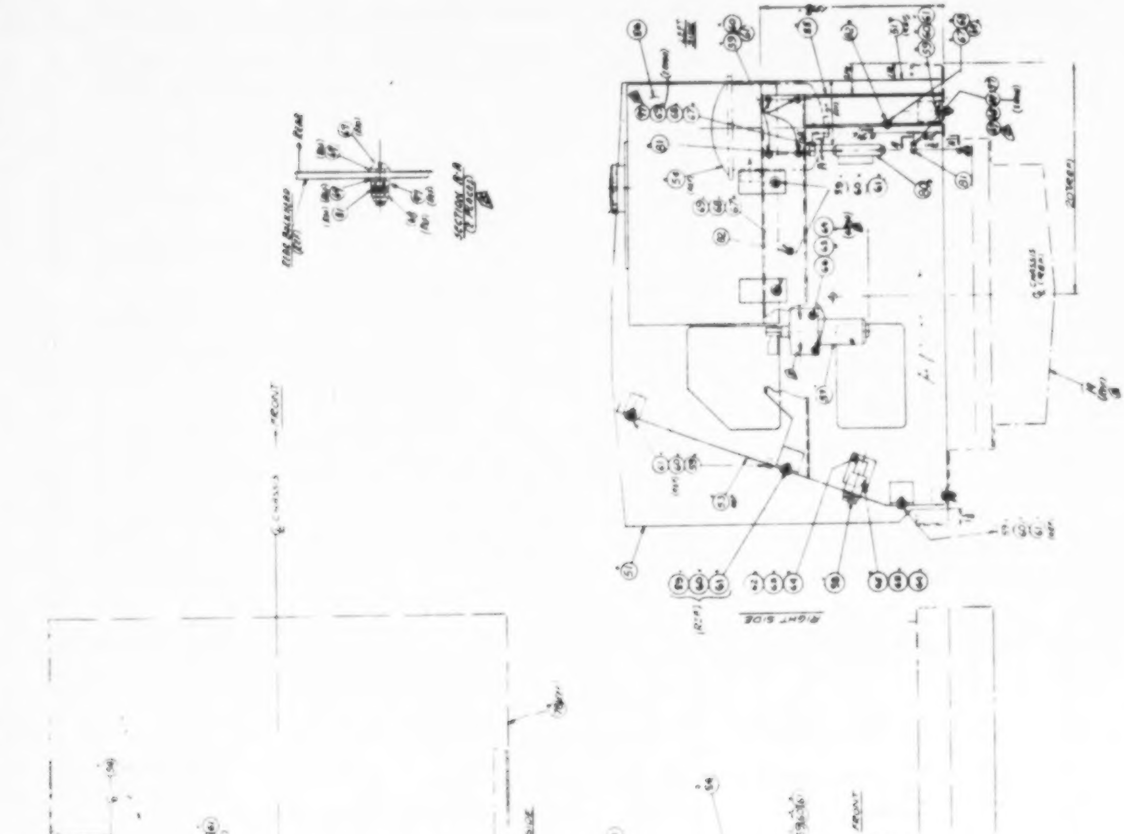

LEFT SIDE
REAR
PLAN
RIGHT SIDE
FRONT
SECTION A-A
ELEVATION
SECTION B-B
℄ CHASSIS

Figure 14

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
13-	28392 SH#1	Chassis Assembly No. 1	31682	1.
-1	MVG-4D 280658	Engine (Wisconson)	66289	1.
-2	408-01180-01 Pump now 2150A AG 9W5D-40	Pump - Weather Head	79470	1.
-3	GJP-7403-A	Generator 12 V	19728	1.
-4	591230	Voltage Regulator (12V)	31947	Ref.
-5	5-58	Solenoid Switch	08018	1.
-6	24C-A9Y	Battery I12V)	19728	1.
-7	500	Magnaloy Coupling- Both Halves 1.75" Dia. Bore	13228	1.
-8	Commercial	3/8" Square x 2" Lg., Steel key		1.
-9	Commercial	7/16" Square x 2" Lg. Steel Key (With Pump Above)		Ref.
-10	28382	Adapter Pump to Engine		1.
-11	Commercial	Hex Hd Bolt ½ - 13 x 5½" lg. (SAE Grade 5) High strength Cad Plate		4.
-12	AN 960-816	Flat Washer (1/16 Thk x 7/8 OD)	88044	4.
-13	21 FAF-813	Flex Loc Nut ½ - 13	56878	4.
-14	Commercial	5/8 - 11 x 1¼ Lg Socket Hd Cap Screw (Cad Plate)		4.
-15	AN 936-A1016	Lockwasher (.045 Thk x 1.07 OD)	88044	4.
-16	Commercial	5/8 - 11 x 4½ Lg Hex Hd. Bolt (SAE grade 5) High Strength Cad Plate		4.
-17	AN 960-1016	Flat Washer 1/16" Thk x 1 3/16 OD	88044	4.
-18	31 FAF-1011	Flex Loc Nut 5/8 - 11	56878	4.
-19	28440	Fuel Tank Assembly (See Fig. 26)	31682	1.
-20	Commercial	5/16 - 18 x 3/4 Lg Hex Hd Screws (Cad Plate)		9.
-21	AN 936-A516	Lockwasher .030 Thk x .067 OD	88044	11.
-22	28370	Chassis Frame Assembly (See Fig. 27)	31682	1.
-23	Commercial	¼ - 20 x 3/4" Lg Hex Hd Cap Screw (Cad Plate)		3.
-24	Commercial	¼ - 20 Hex Nut (Cad Plate)		3.
-25	Commercial	¼ Lock Washer Std. (Cad Plate)		3.
-26	28594-7	Muffler Assembly	31682	1.
-27	28594-6	Muffler Hanger Assembly	31682	2.
-28	Commercial	3/8 - 16 Hex Nut (Cad Plate)		2.
-29	AN 936A616	.030 Thk x .692 OD	88044	2.
-30	4L-430	V-Belt	72781	1.
-31	28536-1	Adj. Arm	31682	1.
-32	28536-2	Clip	31682	1.
-33	28536-3	Bracket	31682	1.
-34	Commercial	No. 10 x ½ Type "A" Pan Hd. Screw (Cad Plate)		2.
-35	Commercial	5/16 - 18 x 1" Hex Hd. Cap Screw (Cad Plate)		2.

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
13-36	Commercial	5/16 - 18 Hex Nut (Cad Plate)		2.
-37	Commercial	3/8 - 16 x 1" Hex Hd. Cap Screw (Cad Plate)		2.
-38	Commercial	1½" 150" Malleable Iron Steel ELL		1.
-39	28624-1	1 3/4" Metal Exhaust Tube Assembly	31682	1.
-40	Commercial	½ - 13 x 2 3/4 Lg. Hex Hd. Cap Screw (Cad plate)		4.
-41	AN 960-816	Washer-Flat 1/16 Thk x 7/8 OD-	88044	4.
-42	Commercial	½ STD. Lock Washer (Cad Plate)		4.
-43	28536-6	Gasket	31682	1.
-44	28571	Flow Control Assembly at Pump	31682	1.
-45	28342-3	Header (Top of pump)	31682	1.
-46	28537	Generator Shield Assembly R.F.I.	31682	1.
-47	28594-4	Battery Pan Assembly	31682	1.
-48	17121-0	Thermo Switch- No setting with modification 8A & 13	73168	1.
-49	QD-727	Gasket (With Engine) (1)	66289	Ref.
-50	MS21919G4	Clamp Cushioned	96906	2.

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
14-	28392-SH#2	Chassis Assembly No. 2	31682	1.
-51	28552-1	Rear Bulkhead Assembly	31682	1.
-52	28553	Engine Start Panel	31682	1.
-53	28364	Control Panel Assembly (See Fig. 28)	31682	1.
-54	Type P-32-52 PN 63080	L.P. Filter Assembly Complete with AN 6236 B element & 3D102 Gasket	81321	1.
-55	28554	Support Assembly - Fluid Tank	31682	1.
-56	28343	Fluid Tank Assembly	31682	1.
-57	AC 8047-1210S	H.P. Filter Complete	01414	1.
-58	408-02550-04 & 428-00014	Pressure Compensator Complete with sub plate (With Pump)	79470	Ref.
-59	Commercial	3/8 - 16 x 1" Lg Hex Hd. Cap Screw (Cad Plate)		18.
-60	21FAF-616	Flex Loc Nut (3/8-16)	56878	18.
-61	Commercial	3/8 Machine Screw Flat Washer 1/16 Thk x 7/8 OD (Cad Plate)		18.
-62	Commercial	¼ - 20 x 2¼" Lg. Hex Hd. Cap Screw (Cad Plate)		1.
-63	21FA-420	Flex Loc Nut ¼ - 20	56878	6.
-64	Commercial	¼ Flat Washer 3/64 Thk x 9/16 OD (Cad Plate)		8.
-65	Commercial	¼ - 20 x 3" Lg. Hex Hd. Cap Screw (Cad Plate)		1.
-66	Commercial	¼ - 20 x 3 3/4 Lg. Hex Hd Cap Screw (Cad Plate)		2.
-67	Commercial	No. 10-32 x 3/4" Lg Round Hd. Cap Screw (Cad Plate)		4.
-68	21FC-1032	Flex Loc Nut	56878	4.
-69	AN 960-10	Flat Washer	88044	10.
-70	YE 435-E	Choke Control with Ene (1)	66289	Ref.
-71	YC-10C	Start SW with Engine (1)	66289	Ref.
-72	8824K14	Ignition Switch	15605	1.
-73	HKP	Fuse Holder	71400	1.
-74	Commercial	¼ - 20 x 1" Lg. Hex Hd. Cap Screw (Cad Plate)		2.
-75	28625-11	Name Plate (Choke Control)	31682	1.
-76	28625-9	Name Plate (Starter Switch)	31682	1.
-77	28625-10	Name Plate (Ignition Switch) Off & On	31682	1.
-80	1201-PS	Filter Fink Electric Switch	31682	1.
-81	MS-21919-G4	Clamp- Cushioned	96906	2.
-82	MS-21919-G4	Clamp- Cushioned	96906	2.
-83	No 2-7	Battery Hold Down	31682	1.
-84	28594-5	Battery Hold Down Bolt Assembly	31682	2.
-85	4DBTX-B	Female Brass ELL	45681	1.
-86	Commercial	¼" OD x .035" Copper Tubing Type "K" (Soft Temper)		5 Ft.
-87	4-4CBTX-B	Male Brass ELL	45681	1.

ig. & ndex No.	Part No.	Description	Vendor	Qty/ Assy.
14-88	5360-C	Gasket	31682	1.
-89	LF-131	Flg"d Muffler Adapter Male with Engine (2)	66289	Ref.
-90	Commercial	3/8 - 16 x 1½" Lg. Hex Hd. Cap Screw (Cad Plate)		4.
-91	21FAF-616	Flex Loc Nut	56878	4.
-92	28625-*	Name Plate (Fuse Holder)	31682	1.
-93	28625-21	Name Plate (Fluid Volume Control)	31682	1.
-94	Commercial	2-56 x ¼"Lg. Pan Head Self Tapping Screw (Type F) (Cad Plate)		10.
-95	Commercial	Lokwell 3/8 - 16 x ½" Lg. Lokwell Set Screw Hex Socket Head with Cup Point		2.
-96	AGC-5	Fuse	71400	1.
-97	Commercial	10-32 Hex Nut (Cad Plate)		2.

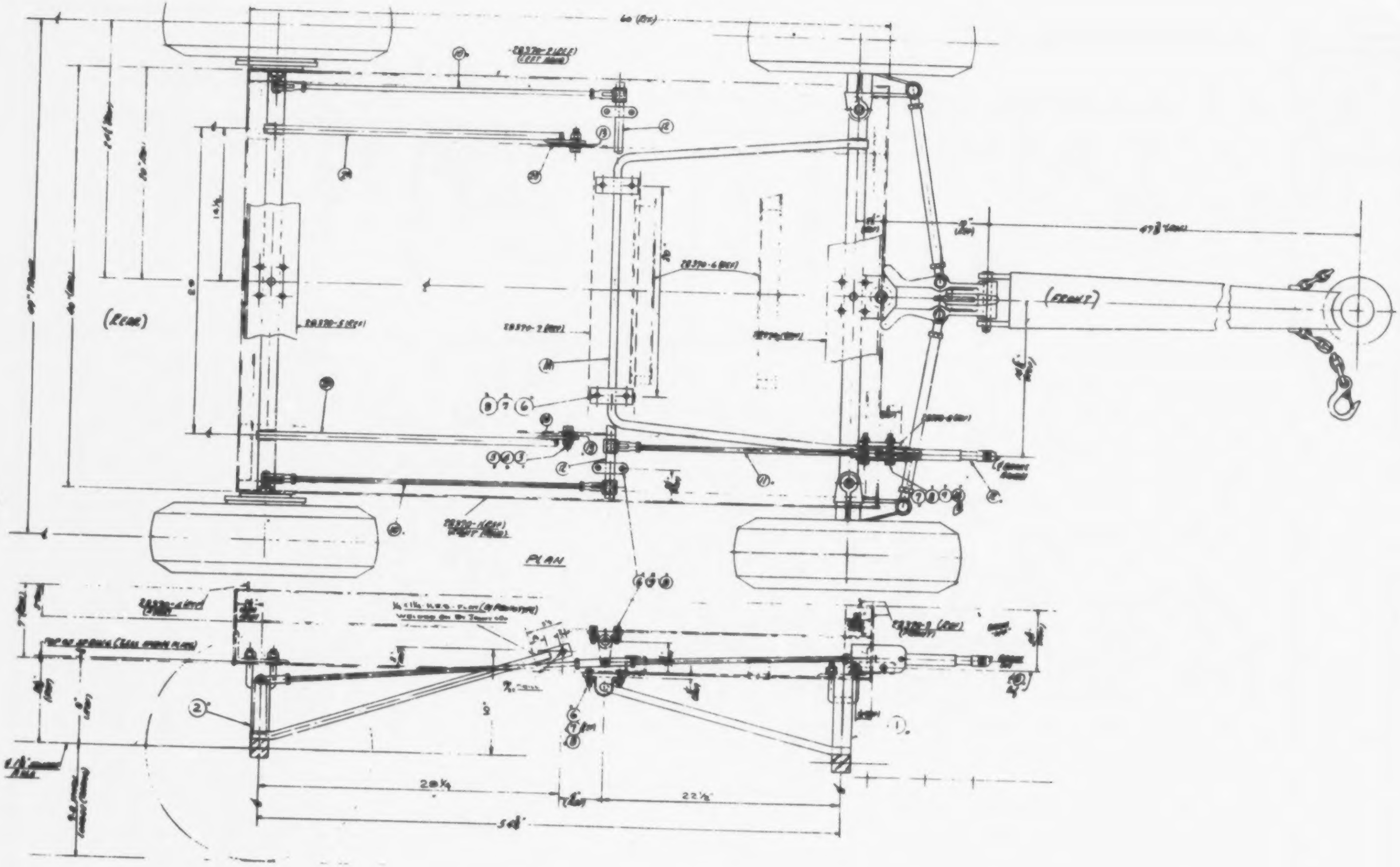
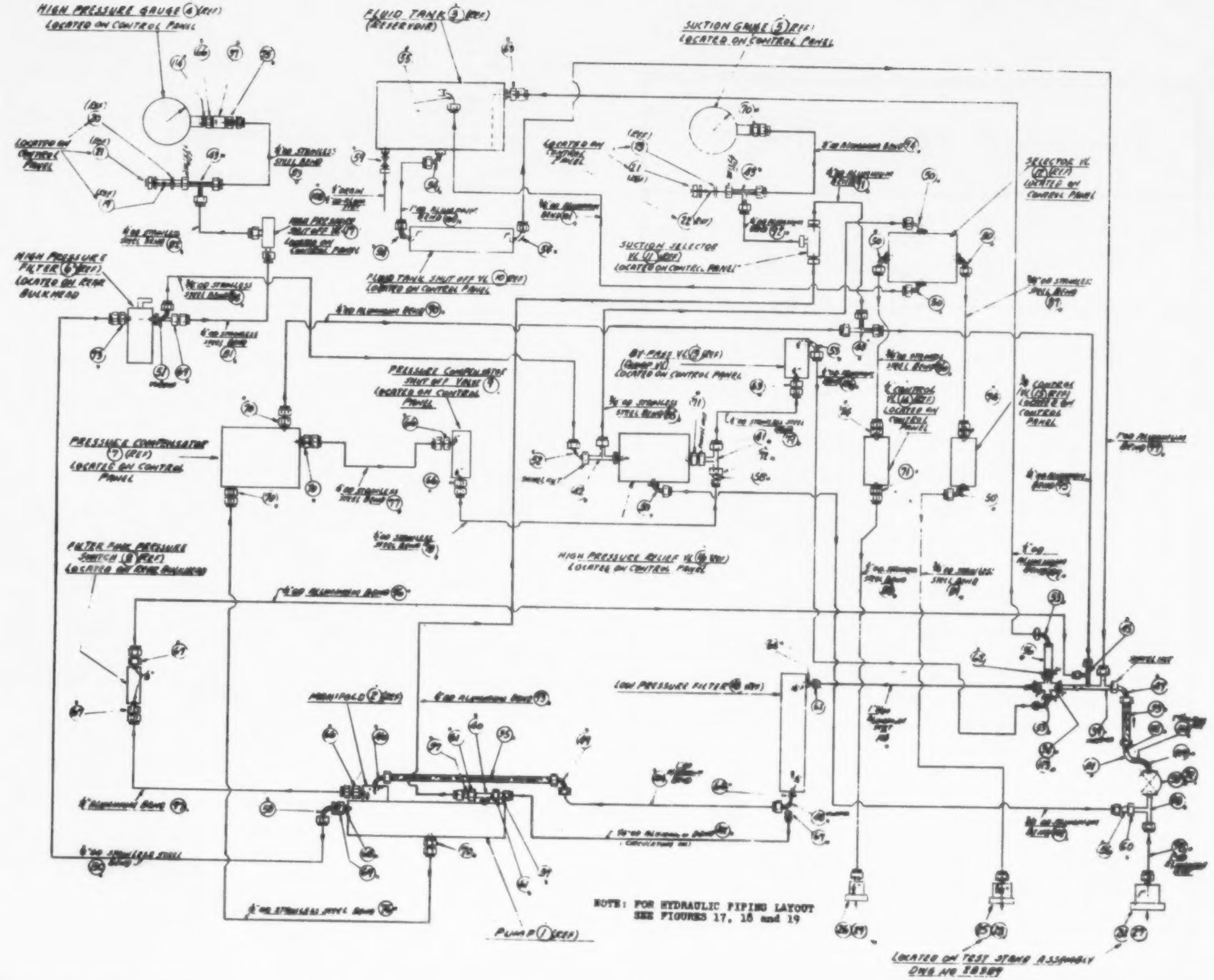

(REAR)
(FRONT)
PLAN
28370-6(REV)
28370-7(REV)
20¾
22½"
①
②

Figure 15

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
15-	28391	Assembly - Undercarriage D-5B Unit	31682	1.
-1	66D0646	Front Axle & Spring Assembly	22938	1.
-2	66D0646	Rear Axle & Spring Assembly	22938	1.
-3	Commercial	Bolt ½ - 13 x 1¼" Lg Hex Hd (Cad Plate)		2.
-4	21FAF-813	Flex Loc Nuts	56878	2.
-5	AN960-816	Flat Washer 1/16 Thk x 7/8" OD	88044	4.
-6	Commercial	Bolt 3/8 - 16 x 1¼" Lg Hex Head (Cad Plate)		8.
-7	21FAF-616	Flex Loc Nuts	56878	10.
-8	AN960-616	Flat Washer (1/16" Thk x 5/8"OD	88044	10.
-9	Commercial	Bolt 3/8 - 16 x 2¼" Lg Hex Head (Cad Plate)	31682	2.
-10	28536-7	3/8" Dia Brake Rod 31" Lg	31682	2.
-11	28536-8	3/8" Dia Brake Rod 22" Lg	31682	1.
-12	65C0505	Hand Brake Assembly	22938	1.
-13	TT-801	Oilite Bronze Bearing	31682	2.
-14	Commercial	Bolt Spacer 3/8" s/40 Steel Pipe 15/16" Lg.		2.


HIGH PRESSURE GAUGE ④ (REF)
LOCATED ON CONTROL PANEL
LOCATED ON CONTROL PANEL
FLUID TANK ③ (REF)
(RESERVOIR)
SUCTION GAUGE ⑤ REF
LOCATED ON CONTROL PANEL
LOCATED ON CONTROL PANEL
HIGH PRESSURE SHUT OFF VL
LOCATED ON CONTROL PANEL
FLUID TANK SHUT OFF VL ⑩ (REF)
LOCATED ON CONTROL PANEL
SUCTION SELECTOR VL ⑪ (REF)
LOCATED ON CONTROL PANEL
SELECTOR VL ⑫ (REF)
LOCATED ON CONTROL PANEL
HIGH PRESSURE FILTER ⑥ (REF)
LOCATED ON REAR BULKHEAD
BY-PASS VL ⑬ (REF)
(DUMP VL)
LOCATED ON CONTROL PANEL
PRESSURE COMPENSATOR SHUT OFF VALVE ⑨
LOCATED ON CONTROL PANEL
PRESSURE COMPENSATOR ⑦ (REF)
LOCATED ON CONTROL PANEL
CONTROL VL ⑭ (REF)
LOCATED ON CONTROL PANEL
CONTROL VL ⑮ (REF)
LOCATED ON CONTROL PANEL
HIGH PRESSURE RELIEF VL ⑯ (REF)
LOCATED ON CONTROL PANEL
FILTER PUMP PRESSURE SWITCH ⑧ (REF)
LOCATED ON REAR BULKHEAD
LOW PRESSURE FILTER ⑱ (REF)
MANIFOLD ② (REF)
PUMP ① (REF)
LOCATED ON TEST STAND ASSEMBLY
DWG NO 38389

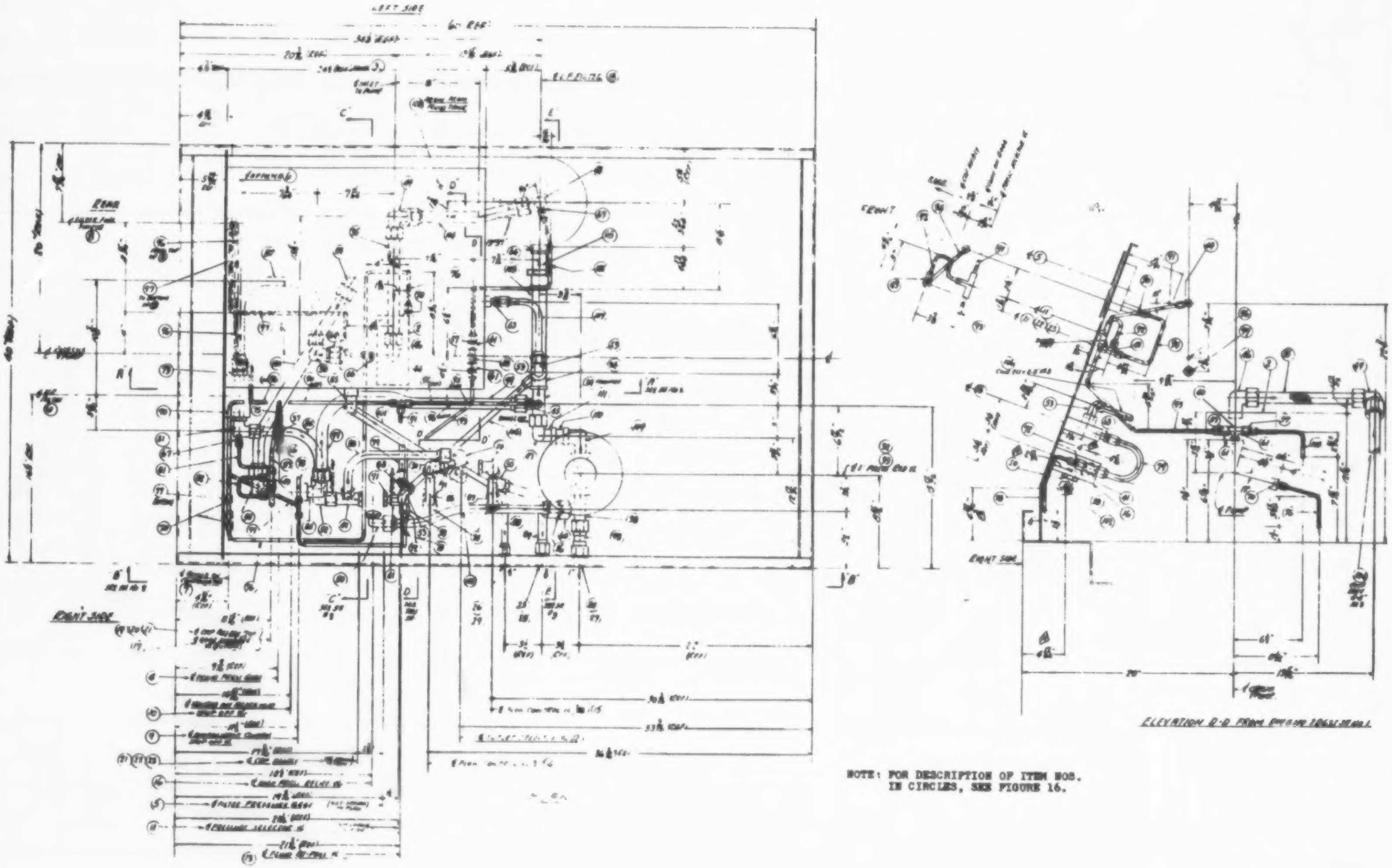
NOTE: FOR HYDRAULIC PIPING LAYOUT
SEE FIGURES 17, 18 and 19

Figure 16

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
16-	28598	Hydraulic Piping Diagram	31682	1.
-1	28392-2	Pump	79470	Ref.
-2	28392-45	Pump Manifold	31682	Ref.
-3	28392-56	Fluid Tank (Reservoir)	31682	Ref.
-4	28364-1	Fluid Pressure Gauge	61349	Ref.
-5	28364-2	Filter Pressure Gauge	61349	Ref.
-6	28392-57	High Pressure Filter	01414	Ref.
-7	28364-24	Pressure Compensator	79470	Ref.
-8	28392-80	Filter Fink Pressure Switch (1/8" Female NPT)	31682	Ref.
-9	28364-23	Compensator Control Shut-Off Valve	09990	Ref.
-10	28364-18	Reservoir Shut-Off Valve (1" Female NPT)	13902	Ref.
-11	28364-11	Pressure Selector Valve (¼" Flareless Nuts)	13174	Ref.
-12	28364-10	Outlet Selector Valve	89326	Ref.
-13	28364-19	Fluid Bypass Valve (½" Female NPT)	09990	Ref.
-14	28364-20	Flow Control Vl ½"	86768	Ref.
-15	28364-21	Flow Control Vl 3/4"	86768	Ref.
-16	28364-22	High Pressure Relief Vl	96259	Ref.
-17	28364-17	Gauge Snubber Valve	86768	Ref.
-18	28392-54	Low Pressure Filter (1¼" Female NPT)	81321	Ref.
-19	28364-56	Bulkhead Union (Steel)	88044	Ref.
-20	28364-57	Bulkhead Nut (Steel)	88044	Ref.
-21	28364-12	Cap Assembly	88044	Ref.
-22	28364-33	Bulkhead Union (Alum)	88044	Ref.
-23	28364-13	Bulkhead Nut (Alum)	88044	Ref.
-24	28389-22	1" Half Coupling (Aeroquip)	00624	Ref.
-25	28389-23	3/4" Half Coupling (Aeroquip)	00624	Ref.
-26	28384-24	½" Half Coupling (Aeroquip)	00624	Ref.
-27	28389-25	1" Dust Cap (Aeroquip)	00624	Ref.
-28	28389-26	3/4" Dust Cap (Aeroquip)	00624	Ref.
-29	28389-27	½" Dust Cap (Aeroquip)	00624	Ref.
-32	Commercial	Dust Cover for item #33	31682	1.
-33	Type-U	1" Foster Pressure reducing Valve with 1" Female NPT	31682	1.
-34	1KMM00-S	1" Pipe Cross	45681	1.
-35	Type 130 130000-16Z-0102	1"Flexible Hose	78570	2.
-36	3C13-4-15	½" Relief Valve (½" Female NPT)	46259	1.

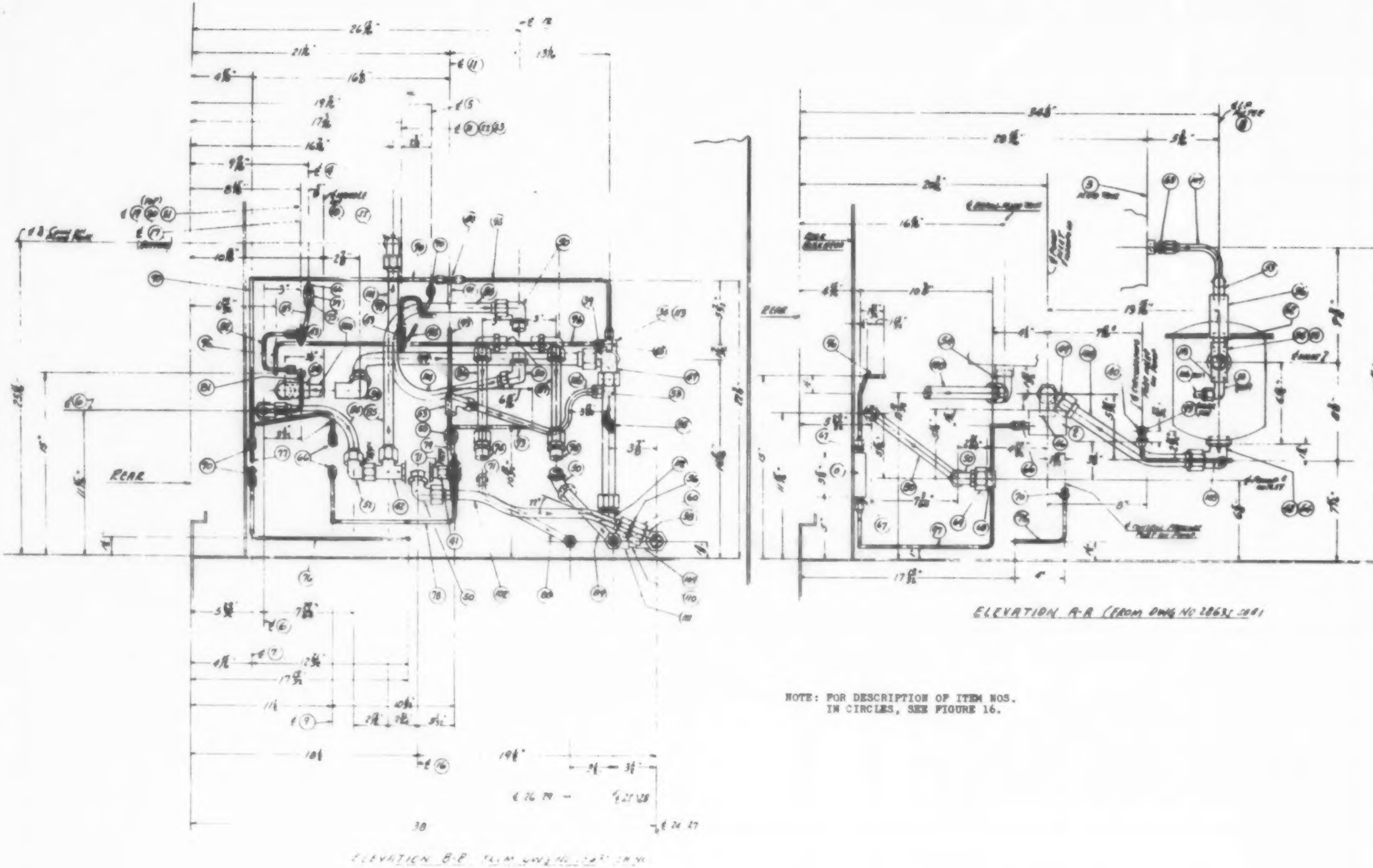
Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
16-37	½-1106-B	½" Pulsation Dampener Inlet ½" Male NPT Outlet ½" Female NPT	38056	1.
-38	C5755X16	Tee	79470	1.
-39	28342-5	Tee C5755 x 16 (Modified)	31682	1.
-40	6S50X-S	Tee with Buna "N" "O" Ring	45681	1.
-41	8S6X-S	Swivel Nut Branch Tee	45681	1.
-42	12R50X-S	Tee Parker with Buna "N" "O" Ring	45681	1.
-43	4R6X-S	Swivel Nut Run Tee	45681	2.
-44	4JTX-S	Tee	45681	1.
-45	4RTX-S	Tee	45681	1.
-46	16CTX-S	90° ELL	45681	1.
-47	16C6X-S	Swivel Nut 90° ELL	45681	1.
-48	28342-4	90° ELL 16CTX-S (modified)	31682	1.
-49	16ETX-S	90° ELL	45681	1.
-50	12C50X-S	90° ELL with Buna "N" "O" Ring	45681	7.
-51	28342-6	90° ELL (Modified) (with Buna "N" "O" Ring)	45681	1.
-52	12C6X-S	Swivel Nut 90° ELL	45681	1.
-53	8-8CTX-S	90° ELL	45681	3.
-54	16CTX-S	90° ELL	45681	3.
-55	12CTX-S	90° ELL	45681	1.
-56	16-12TRTX-S	Tube End Reducer	45681	1.
-57	6-4TRTX-S	Tube End Reducer	45681	2.
-58	8-4TRTX-S	Tube End Reducer	45681	1.
-59	101-HD ½ x 3/8	Drain Valve	13174	1.
-60	16BTX-S	Nut	45681	1.
-61	6BTX-S	Nut	45681	2.
-62	Commercial	Nipple ½" S/40 Black Steel Pipe 1 1/8" ETOE both ends NPT		1.
-63	8-8FTX-S	Connector	45681	2.
-64	Commercial	1¼" x 1" Forged Steel Flush Pipe Bushing		2.
-65	Commercial	1" 150# Black, Male & Female M.I. Union		1.
-66	4-4 FTX-S	Connector	45681	4.
-67	4 FTX-S	Connector		4.
-68	3-916	"O" Ring Buna "N"	45681	1.
-69	AN 893-22	Reducing Bushing	88044	1.
-70	4F50X-S	Connector with Buna "N" "O" Ring-	45681	5.
-71	8-12F50X-S	Connector with Buna "N" "O" Ring	45681	2.
-72	8 BTX-S	Nut	45681	1.
-73	12F50X-S	Connector with Buna "N" "O" Ring	45681	1.
-74	12F50X-S	Connector with Buna "N" "O" Ring	45681	2.
-75	4-4GTX-S	Connector	45681	1.

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
16-76	28603-1	¼" OD Stainless Steel Bend Assembly	31682	1.
-77	28603-2	¼" OD Stainless Steel Bend Assembly	31682	1.
-78	28603-3	¼" OD Stainless Steel Bend Assembly	31682	1.
-79	28604-1	½" OD Stainless Steel Bend Assembly	31682	1.
-80	28604-3	3/4 OD Stainless Steel Bend Assembly	31682	1.
-81	28603-4	¼" OD Stainless Steel Bend Assembly	31682	1.
-82	28603-5	¼" OD Stainless Steel Bend Assembly	31682	1.
-83	28603-6	¼" OD Stainless Steel Bend Assembly	31682	1.
-84	28604-4	3/4" OD Stainless Steel Bend Assembly	31682	1.
-85	28604-5	3/4" OD Stainless Steel Bend Assembly	31682	1.
-86	28604-6	3/4" OD Stainless Steel Bend Assembly	31682	1.
-87	28604-7	3/4" OD Stainless Steel Bend Assembly	31682	1.
-88	28604-2	½" OD Stainless Steel Bend Assembly	31682	1.
-89	28604-8	3/4" OD Stainless Steel Bend Assembly	31682	1.
-90	28605-1	¼" OD Aluminum Bend Assembly	31682	1.
-91	28605-2	¼" OD Aluminum Bend Assembly	31682	1.
-92	28605-3	¼" OD Aluminum Bend Assembly	31682	1.
-93	28605-4	¼" OD Aluminum Bend Assembly	31682	1.
-94	28605-5	¼" OD Aluminum Bend Assembly	31682	1.
-95	28605-6	¼" OD Aluminum Bend Assembly	31682	1.
-96	28605-7	¼" OD Aluminum Bend Assembly	31682	1.
-97	28606-1	¼" OD Aluminum Bend Assembly	31682	1.
-98	28607-3	1" Straight Assembly (Aluminum)	31682	1.
-99	28607-4	1" OD Aluminum Bend Assembly	31682	1.
-100	28607-5	1" OD Aluminum Bend Assembly	31682	1.
-101	28607-1	3/4" OD Aluminum Bend Assembly	31682	1.
-102	28607-2	3/4" OD Aluminum Bend Assembly	31682	1.
-103	28342-2	1" S/40 Aluminum Straight Pipe	31682	1.
-104	28607-6	1" OD Aluminum Bend Assembly	31682	1.
-105	28606-2	¼" OD Aluminum Bend Assembly	31682	1.
-106	28606-3	½" OD Aluminum Bend Assembly	31682	1.
-107	28606-4	½" OD Aluminum Bend Assembly	31682	1.
-108	28606-5	½" OD Aluminum Straight	31682	1.
-109	C3409X16	90° ELL	79470	1.
-110	Commercial	1" S/40 Aluminum Pipe Nipple 1 3/4" Lg. both ends N.P.T.		1.
-111	1DDS	90° ELL	45681	1.
-112	16FTX-S	Connector Parker	45681	1.
-113	Commercial	1" x ½" Forged Steel Flush Pipe Bushing		2.
-114	3-4	"O" Ring Buna "N" for ¼" OD Tube	45681	1.


LEFT SIDE
60 REF.
REAR
FRONT
RIGHT SIDE
ELEVATION D-D FROM

NOTE: FOR DESCRIPTION OF ITEM NOS.
IN CIRCLES, SEE FIGURE 16.

Figure 17



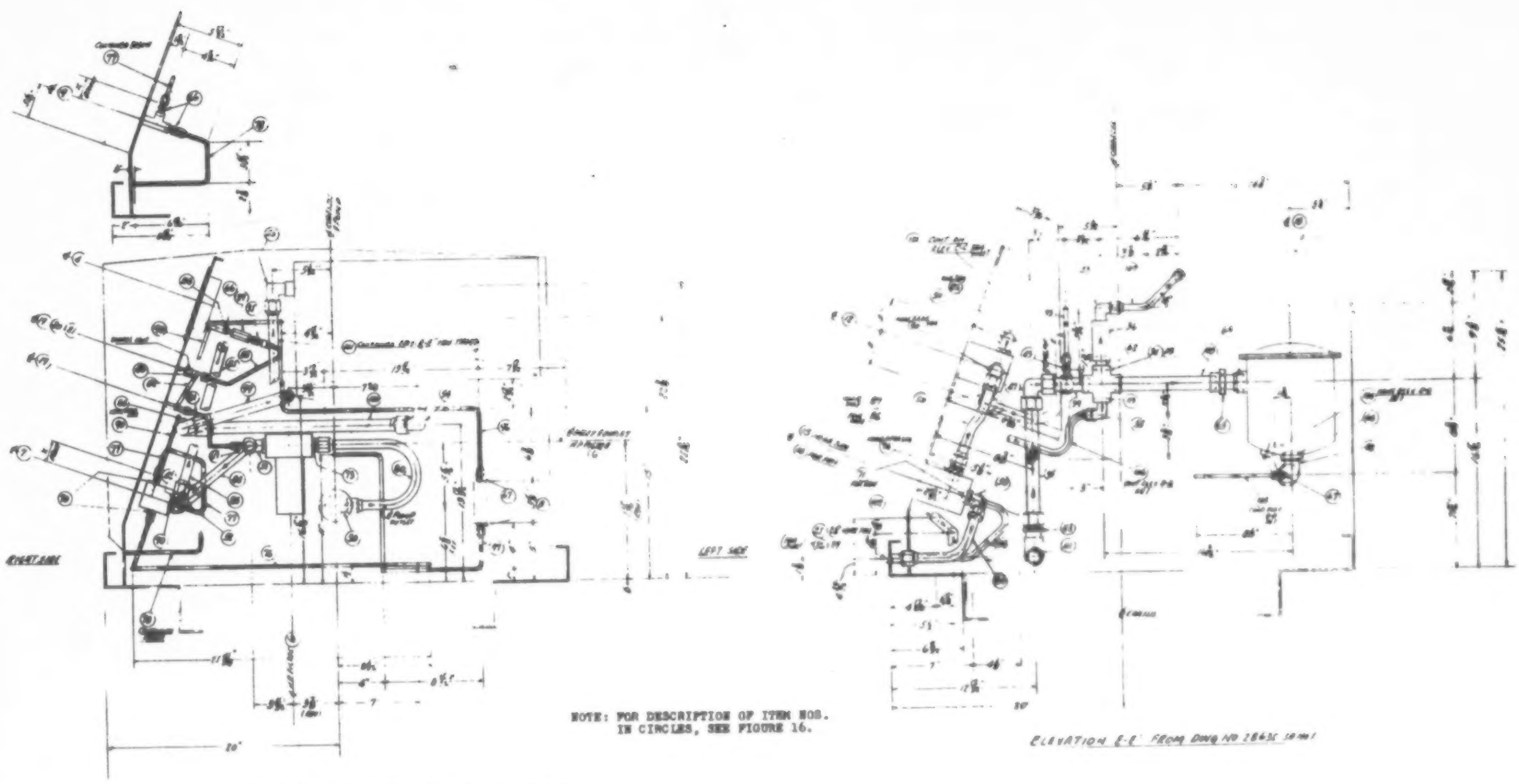
ELEVATION B-B FROM DWG NO [illegible]

ELEVATION A-A (FROM DWG NO 28631 5001

NOTE: FOR DESCRIPTION OF ITEM NOS.
IN CIRCLES, SEE FIGURE 16.

Figure 18

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
20-	28646	Wiring Schematic	31682	1.
-1	28645-1	Wiring Harness	31682	1.
-2	28645-2	Wiring Harness	31682	1.
-3	28643-4	Wire Assembly	31682	1.
-4	28643-6	Wire Assembly	31682	1.
-5	28643-2	Wire Assembly	31682	1.
-6	28643-5	Wire Assembly	31682	1.
-7	28643-1	Wire Assembly	31682	1.
-8	28643-3	Wire Assembly	31682	1.
-9	29644-3	Wiring Harness	31682	1.
-10	28644-1	Wire Assembly	31682	1.
-11	28644-2	Wire Assembly	31682	1.
-12	28643-7	Wire Assembly	31682	1.
-13	28643-8	Wire Assembly	31682	1.
-14	Commercial	#2 Battery Cable Lug Both Ends 16" C to C		1.
-15	Commercial	#2 Battery Cable Lug One End Battery Clamp Other End 14" C to C		1.
-16	Commercial	Neg. Ground Strap Lug One End, Battery Clamp Other End 5½" C to C		1.


RIGHT SIDE
LEFT SIDE
20"
30"

NOTE: FOR DESCRIPTION OF ITEM NOS.
IN CIRCLES, SEE FIGURE 16.

ELEVATION C-C FROM DWG NO 2863C SH NO 1

ELEVATION E-E' FROM DWG NO 2863C SH NO 1

Figure 19

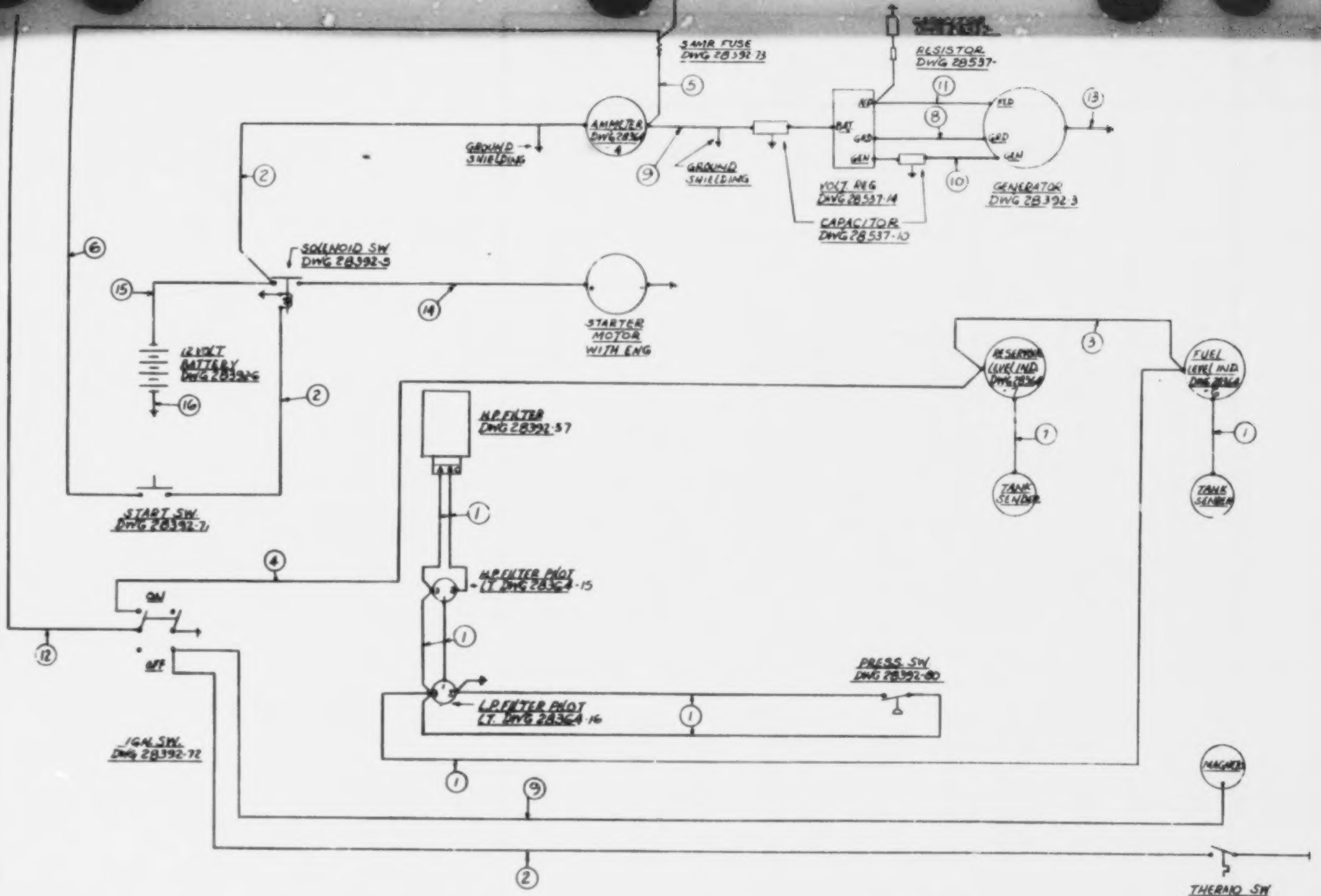

5 AMP FUSE
DWG 28392 73
RESISTOR
DWG 28537-
5
11
13
AMMETER
DWG 2836
4
FLD
8
BAT
GRD
GEN
GROUND
SHIELDING
9
GROUND
SHIELDING
10
VOLT REG
DWG 28537-14
GENERATOR
DWG 28392-3
CAPACITOR
DWG 28537-10
2
6
SOLENOID SW
DWG 28392-9
15
14
STARTER
MOTOR
WITH ENG
3
12 VOLT
BATTERY
DWG 28392-6
RESERVOIR
LEVEL IND
DWG 2836
FUEL
LEVEL IND
DWG 2836
-6
2
16
H.P. FILTER
DWG 28392-57
1
1
TANK
SENDER
TANK
SENDER
START SW
DWG 28392-7
1
4
H.P. FILTER PILOT
LT DWG 28364-15
ON
1
12
OFF
PRESS SW
DWG 28392-80
L.P. FILTER PILOT
LT DWG 28364-16
1
IGN SW
DWG 28392-72
1
9
MAGNETO
2
THERMO SW
DWG 28392-48

Figure 20

best copy available

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
21-	28591	Engine Overhead & Fluid Tank Overhead Access Door Assemblies	31682	1.
-1A	28591	14 3/8" x 27 7/16" x 16 Gauge Formed Sheet	31682	2.
-1B	Commercial	Hinge 1 1/16" Open Width .090 Dia. Pin .045" Thk Steel 25 13/16" Lg.	31682	2.
-1C	91S2-38W0	Stud Assembly	71286	2.
-1D	9153-1	Retaining Washer	71286	2.
-1E	5601	Hook Plate (Door Holder) (Steel)	31682	2.
-1F	Commercial	10-24 x 5/8" Lg Pan Head Slotted Machine Screw (Cad Plate)		8.
-1G	21FA-1024	Flex Loc Nut	56878	8.
-1H	AN960-10	Flat Washer (.063" Thk x .438 OD)	88044	8.
-2A	28591	14" x 17 3/4" x 16 gauge Formed Sheet	31682	1.
-2B	Commercial	Hinge 1 1/16" Open width .090" Dia. Pin .045" Thk (Steel) 16 1/8" Lg.		1.
-2C	91S2-38W0	Stud Assembly	71286	1.
-2D	9153-1	Retaining Washer	71286	1.
-2E	5601	Hook Plate (Door Holder)	31682	1.
-2F	Commercial	10-24 x 5/8" Lg Pan Head Slotted Machine Screw (Cad Plate)		4.
-2G	21FA-1024	Flex Loc Nut	56878	4.
-2H	AN960-10	Flat Washer (.063" Thk .438OD)	88044	4.

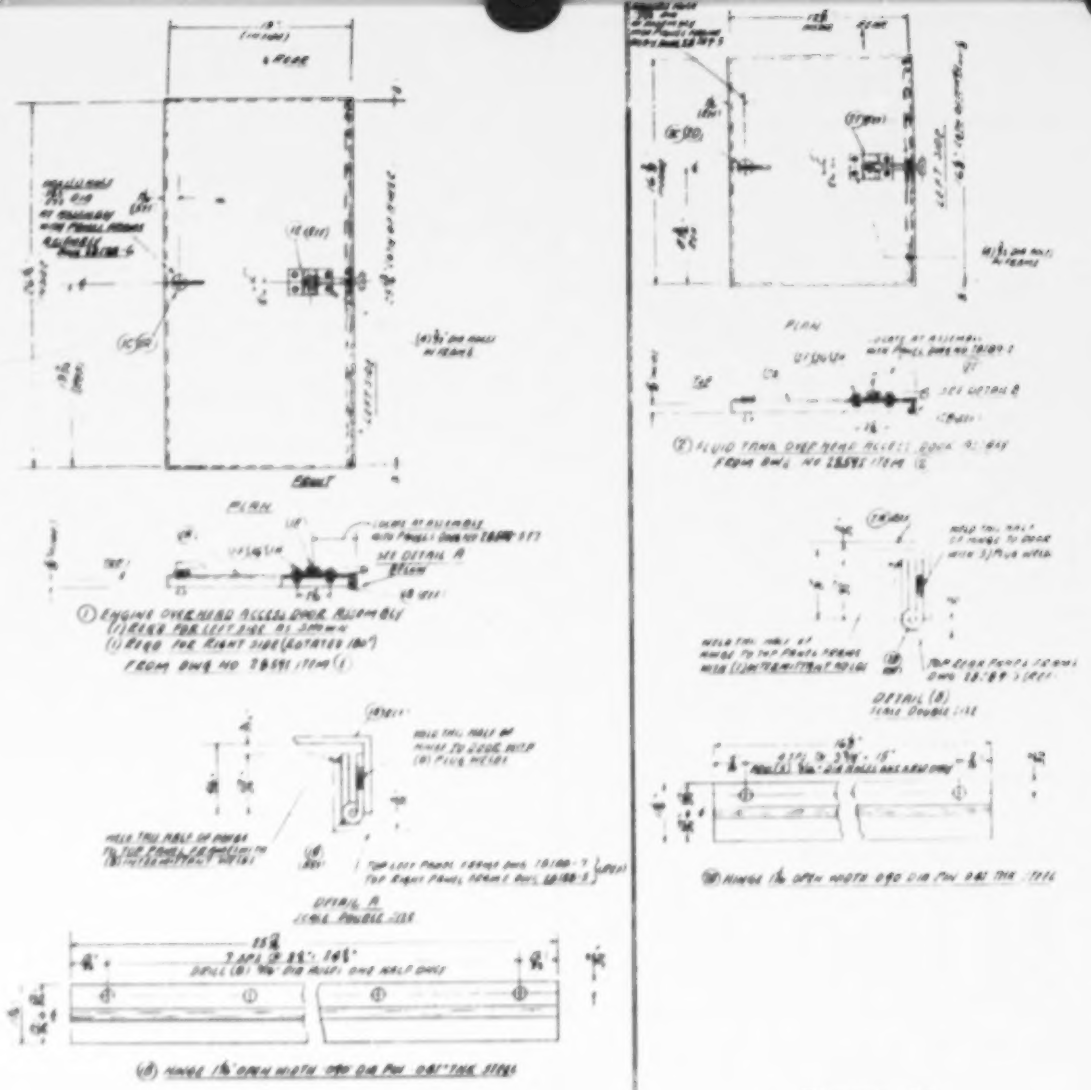

REAR
FRONT
PLAN
SEE DETAIL A BELOW
① ENGINE OVERHEAD ACCESS DOOR ASSEMBLY
(1) REQD FOR LEFT SIDE AS SHOWN
(1) REQD FOR RIGHT SIDE (ROTATED 180°)
FROM DWG NO 28591 ITEM ①
DETAIL A
SCALE DOUBLE SIZE
DRILL (8) DIA HOLES ONE HALF ONLY
(8) HINGE 1½ OPEN WIDTH .090 DIA PIN .081 THK STEEL
LEFT SIDE
PLAN
SEE DETAIL B
② FLUID TANK OVERHEAD ACCESS DOOR ASSEMBLY
FROM DWG NO 28591 ITEM ②
DETAIL (B)
SCALE DOUBLE SIZE
HINGE 1½ OPEN WIDTH .090 DIA PIN .081 THK STEEL

Figure 21

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
22-	28590	Control Panel Access Door Assembly	31682	1.
-1A	28590	20 19/32" x 33 5/8" x 1/16" Gauge Formed Sheet	31682	1.
-1B	28590	11 11/16" x 33 5/8" x 1/16" Gauge Formed Sheet	31682	1.
-1C	Commercial	Hinge 2" Open Width .106 Dia. Pin .045" Thk Steel 33¼" Lg.		2.
-1D	Commercial	Neoprene Weather Strip 1/32" Thk x 2½" wide App 33 5/8" Lg		1.
-1E	Commercial	8-32 x ½" Lg Pan Head Slotted Machine Screw (Cad Plate)		10.
-1F	AN 960-8	Flat Washer (.032" Thk x 3/8" OD)	88044	10.
-1G	21FA-832	Flex Loc Nut	56878	10.
-1H	HS-11	Strikes	06004	2.
-1J	Commercial	4-40 x 7/16" Lg Pan Head Slotted Machine Screw (Cad Plate)		4.
-1K	AN 960-4	Flat Washer (.035" Thk x 5/16" OD)	88044	4.
-1L	21FA-440	Flex Loc Nut	56878	4.

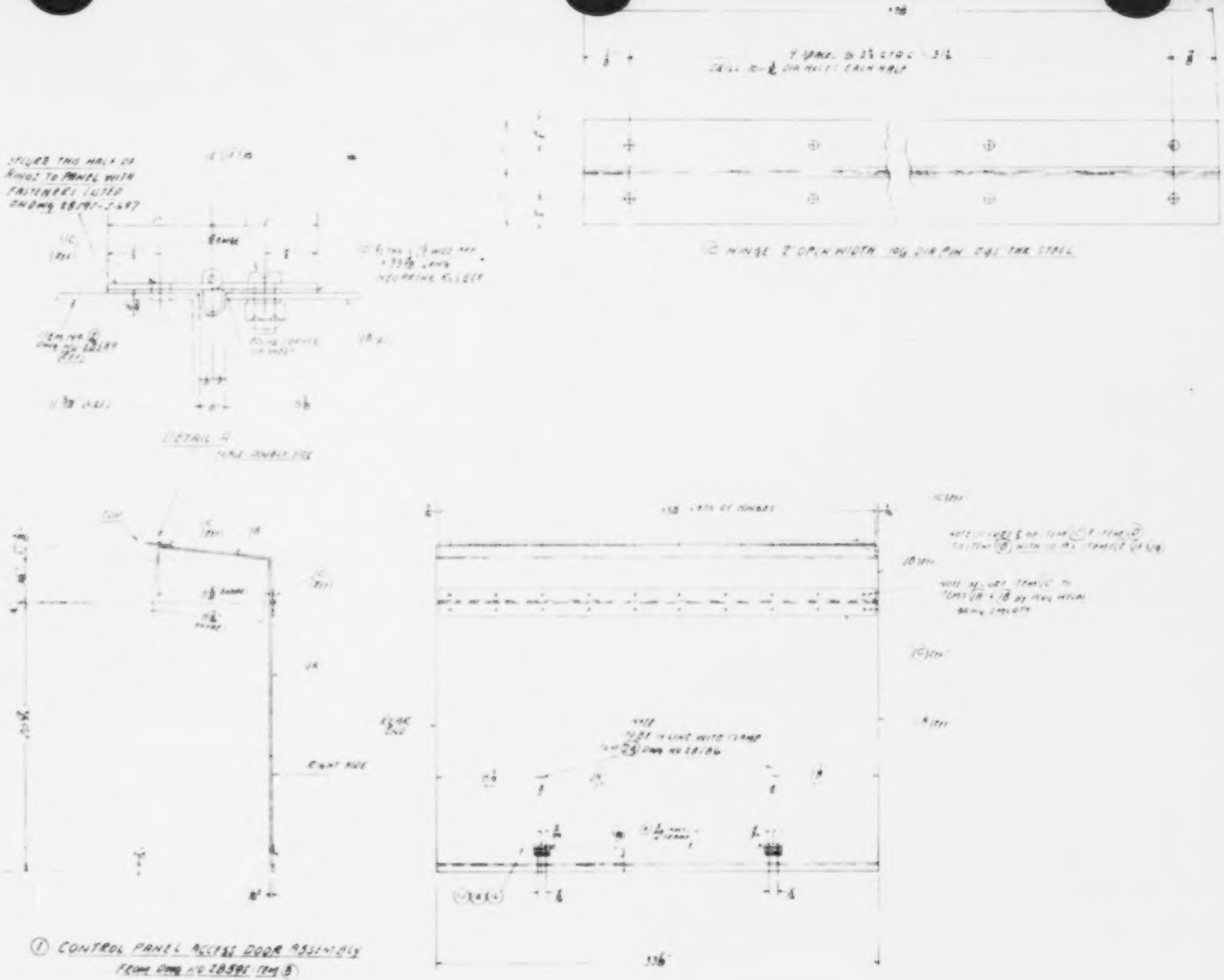

SECURE THIS HALF OF HINGE TO PANEL WITH FASTENERS LISTED ON DWG 28191-S-697
DETAIL A
② HINGE 2" OPEN WIDTH
RIGHT SIDE
LGTH OF HINGES
① CONTROL PANEL ACCESS DOOR ASSEMBLY

Figure 22

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
23-	28592	Engine Side Door & Fuel Tank Access Door Assemblies	31682	
-1A	28592	12 3/8" x 24 3/8" x 1/16" Gauge Formed Sheet	31682	2.
-1B	Commercial	Hinge 2" Open Width .106 Dia. Pin .045" Thk Steel 23" Lg		2.
-1C	9152-20W0	Stud Assembly	71286	2.
-1D	9153-1	Retaining Washer	71286	2.
-2A	28592	23 7/16" x 29" x 1/16 " Gauge formed sheet	31682	1.
-2B	Commercial	Hinge 2" Open Width .106" dia. Pin .045" Thk Steel 22 1/16" Lg.		1.
-2C	28592	11 1/16" x 18" x 1/16" Gauge Formed Sheet	31682	1.
-2D	91S2-20W0	Stud Assembly	71286	1.
-2E	9153-1	Retaining Washer	71286	1.

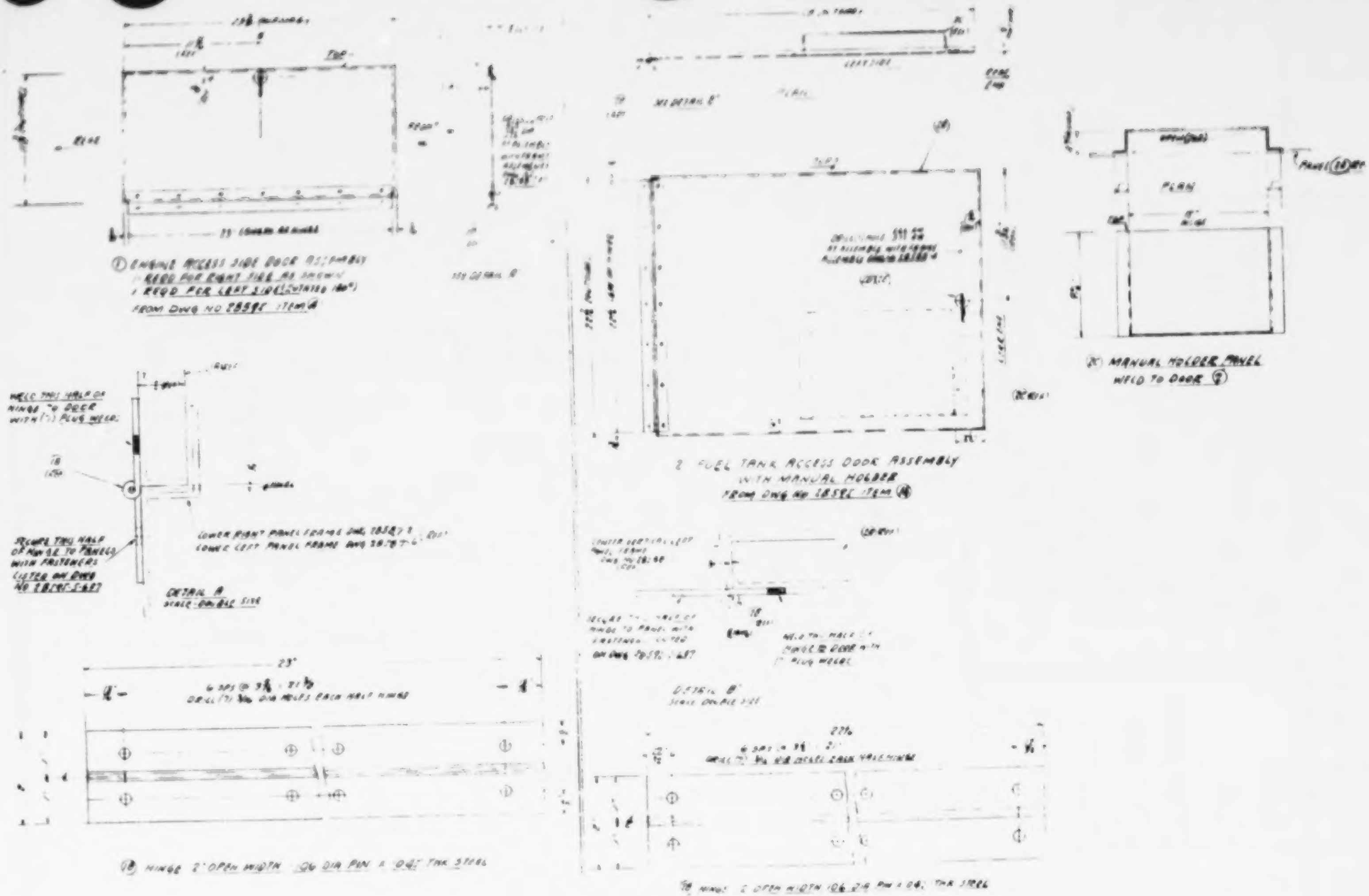

① ENGINE ACCESS SIDE DOOR ASSEMBLY
1 REQD FOR RIGHT SIDE AS SHOWN
1 REQD FOR LEFT SIDE (ROTATED 180°)
FROM DWG NO 28595 ITEM ④
TOP
23" LENGTH OF HINGE
SEE DETAIL A
WELD THIS HALF OF HINGE TO DOOR WITH (7) PLUG WELDS
SECURE THIS HALF OF HINGE TO PANELS WITH FASTENERS LISTED ON DWG NO 28595-S-627
LOWER RIGHT PANEL FRAME DWG 28587
LOWER LEFT PANEL FRAME DWG 28587-6
DETAIL A
SCALE-DOUBLE SIZE
23"
6 SPS @ 3⅞ = 21⅛
DRILL (7) DIA HOLES EACH HALF HINGE
⑱ HINGE 2" OPEN WIDTH .06 DIA PIN x .04" THK STEEL
LEFT SIDE
SEE DETAIL B
PLAN
2 FUEL TANK ACCESS DOOR ASSEMBLY
WITH MANUAL HOLDER
FROM DWG NO 28595 ITEM ④
LOWER VERTICAL LEFT PANEL FRAME DWG NO 28588
SECURE THIS HALF OF HINGE TO PANEL WITH FASTENERS LISTED ON DWG 28595-627
WELD THIS HALF OF HINGE TO DOOR WITH (7) PLUG WELDS
DETAIL B
SCALE DOUBLE SIZE
22⅞
6 SPS @ 3½ = 21
DRILL (7) DIA HOLES EACH HALF HINGE
⑱ HINGE 2" OPEN WIDTH .06 DIA PIN x .04" THK STEEL
PLAN
PANEL
ⓧ MANUAL HOLDER PANEL
WELD TO DOOR ②

Figure 23

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
24-	28593	Rear Door, Left Side & Right Side Assembly	31682	
-1A	28593	19 5/16" x 24 11/32" x 1/16" Gauge Formed Sheet	31682	1.
-1B	Commercial	Hinge 2" Open Width .106 Dia. Pin .045 Thk Steel 23" Lg		1.
-1C	9152-20W0	Stud Assembly	71286	2.
-1D	91S3-1	Retaining Washer	71286	2.
-2A	28593	20 5/16" x 24 11/32" x 1/16" Gauge Formed Sheet	31682	1.
-2B	Commercial	Hinge 2" Open Width .106 Dia. Pin .045 Thk Steel 23" Lg		1.

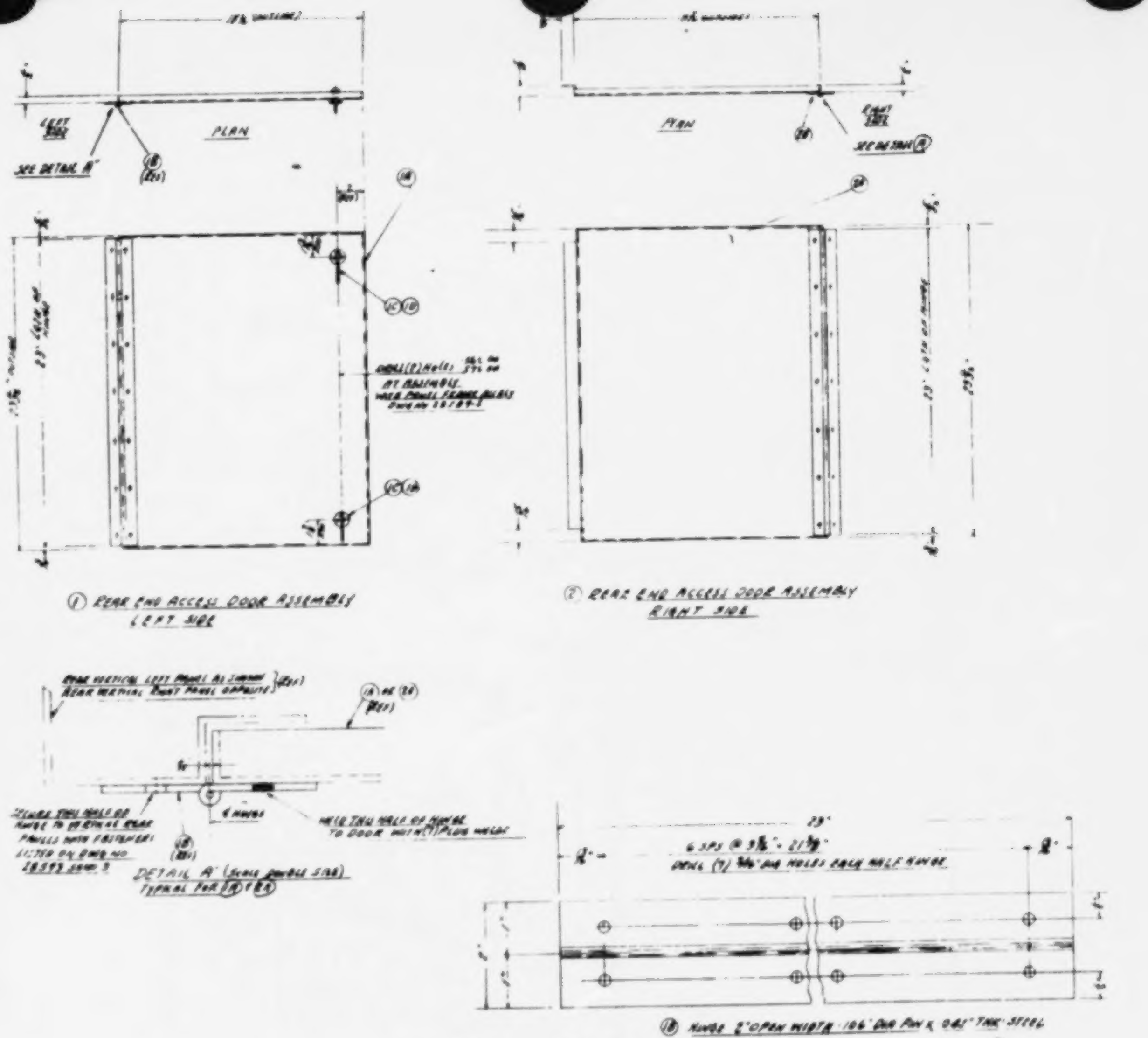

PLAN
LEFT SIDE
SEE DETAIL A
PLAN
RIGHT SIDE
SEE DETAIL A
① REAR END ACCESS DOOR ASSEMBLY LEFT SIDE
② REAR END ACCESS DOOR ASSEMBLY RIGHT SIDE
23" C.C. OF HINGE
23" C.C. OF HINGE
DETAIL A (SCALE DOUBLE SIZE)
TYPICAL FOR 1B & 2B
REAR VERTICAL LEFT PANEL AS SHOWN
REAR VERTICAL RIGHT PANEL OPPOSITE
WELD THRU HALF OF HINGE TO DOOR WITH (7) PLUG WELDS
4 HINGE
23"
6 SPS @ 3⅝" = 21¾"
DRILL (7) DIA HOLES EACH HALF HINGE
1B HINGE 2" OPEN WIDTH .106" DIA PIN & .045" THK STEEL
2B HINGE

Figure 24

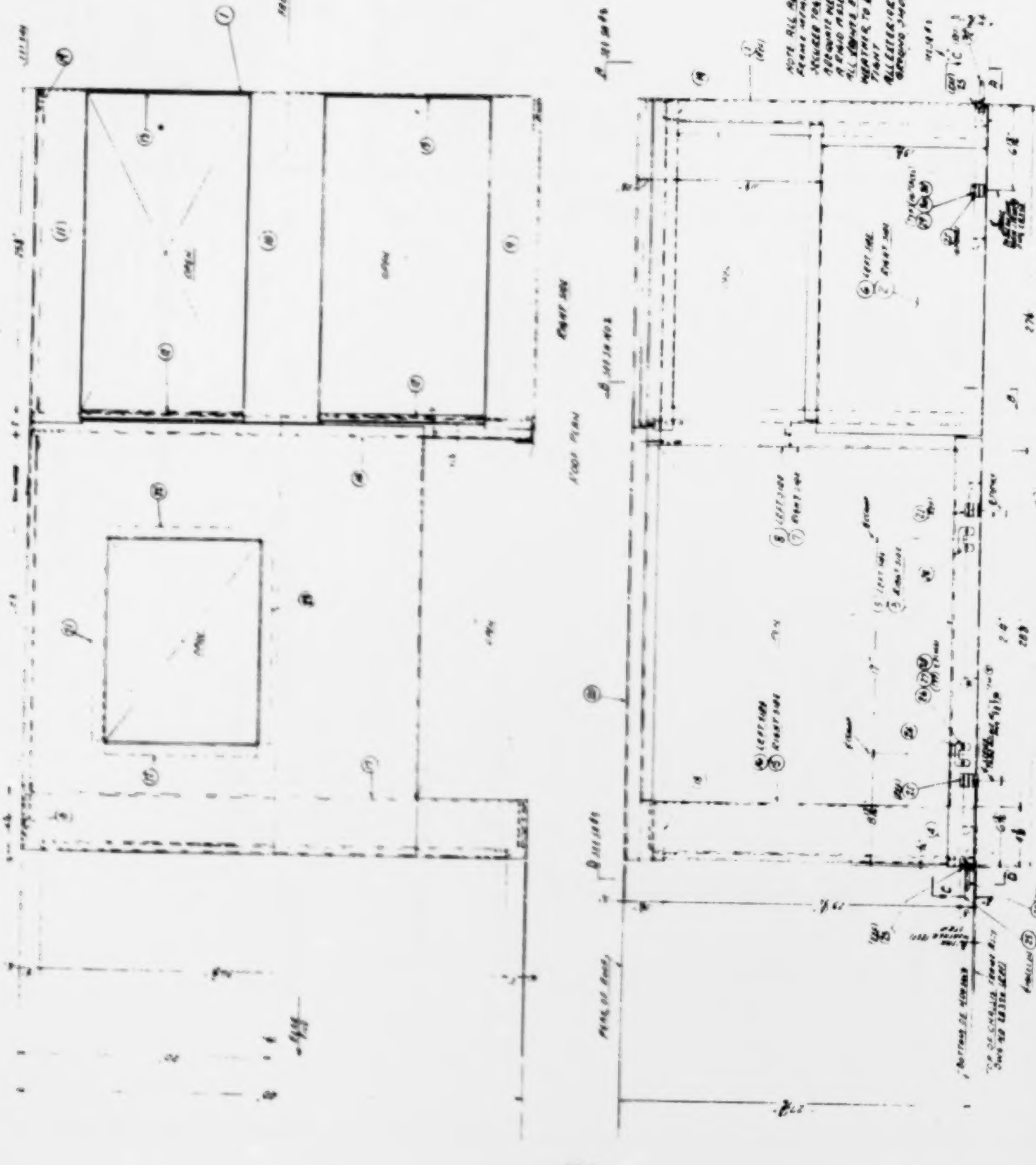

NOTE ALL ADJOINING FRAME MEMBERS TO BE WELDED TOGETHER BY ADEQUATE WELDS TO FORM A RIGID ASSEMBLY.
ALL JOINTS EXPOSED TO WEATHER TO BE WEATHER TIGHT
ALL EXTERIOR WELDS TO BE GROUND SMOOTH
FRONT END
RIGHT SIDE
FLOOR PLAN
RIGHT SIDE ELEVATION

Figure 25

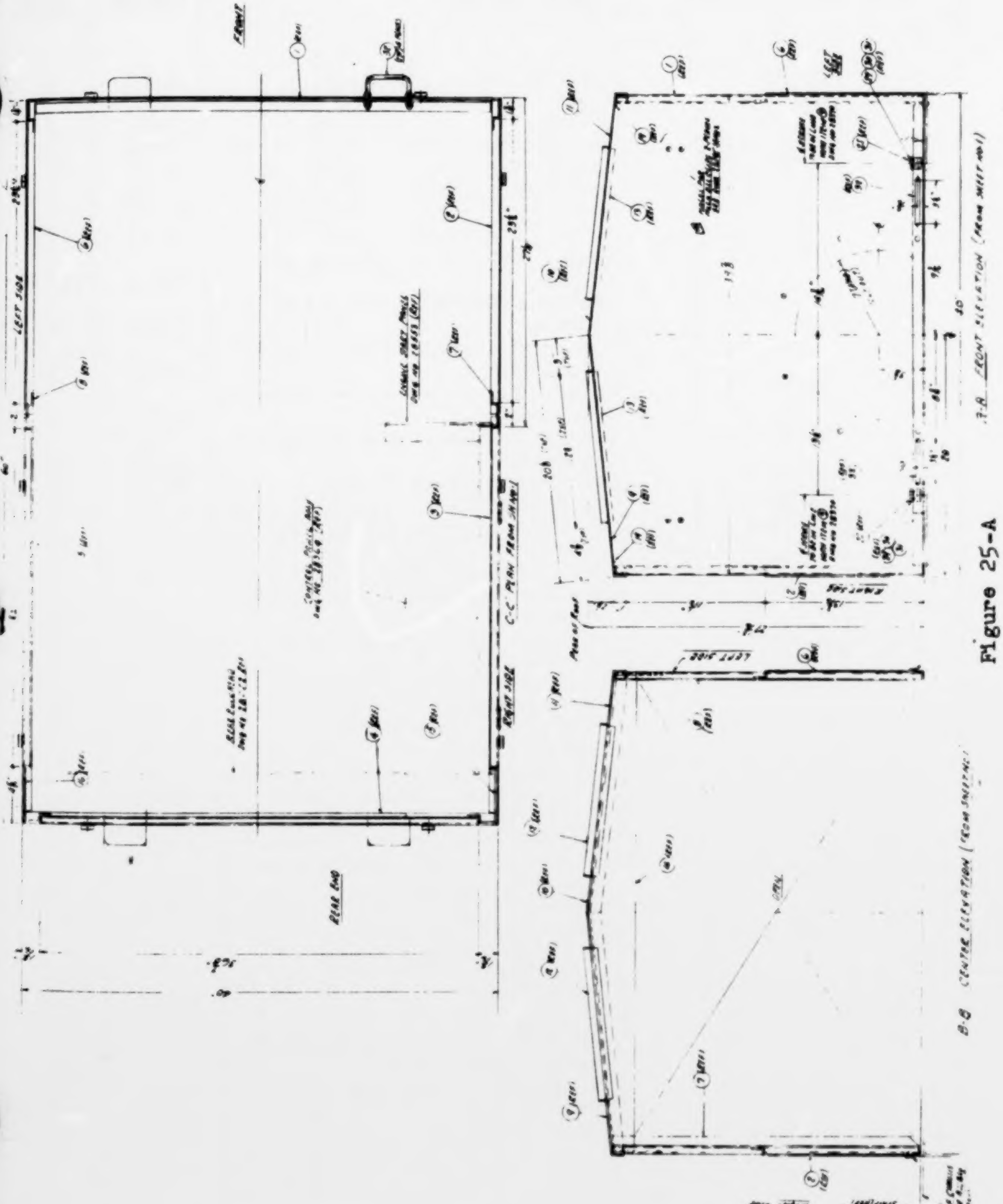

FRONT
LEFT SIDE
RIGHT SIDE
REAR END
C-C PLAN
A-A FRONT ELEVATION
B-B CENTER ELEVATION

Figure 25-A

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
25-				
25A-				
25B-	28586	Housing Frame Assembly	31682	1.
-1	28587-1	Front Vertical Panel Frame Assembly	31682	1.
-2	28587-2	Lower Right Panel Frame (Front)	31682	1.
-3	28587-3	Lower Right Panel Frame (Rear)	31682	1.
-4	28587-4	Lower Rear Panel Frame Assembly	31682	1.
-5	28587-5	Lower Left Panel Frame (Rear)	31682	1.
-6	28587-6	Lower Left Panel Frame (Front)	31682	1.
-7	28588-1	Center Vertical Right Panel Frame	31682	1.
-8	28588-2	Center Vertical Left Panel Frame	31682	1.
-9	28588-5	Top Right Panel Frame (Front) Assembly	31682	1.
-10	28588-6	Center Top Panel Frame (Front) Assembly	31682	1.
-11	28588-7	Top Left Panel Frame (Front) Assembly	31682	1.
-12	28588-8	Top Center Panel Frame	31682	2.
-13	28588-9	Top Front Panel Frame	31682	2.
-14	28589-1	Top Center Truss Panel Frame Assembly	31682	1.
-15	28588-3	Rear Vertical Right Panel Frame	31682	1.
-16	28588-4	Rear Vertical Left Panel Frame Assembly	31682	1.
-17	28589-5	Top Rear Truss Panel Frame Assembly	31682	1.
-18	28588-10	Top Corner Brace Panel Frame (Rear)	31682	2.
-19	28588-11	Top Corner Brace Panel Frame (Front)	31682	2.
-20	28589-2	Roof Panel Frame (Rear) Assembly	31682	1.
-21	28589-3	Top Rear Panel Frame (Left)	31682	1.
-22	28589-4	Top Rear Panel Frame (Right)	31682	2.
-23	28589-7	Top Rear Panel Frame Assembly	31682	1.
-24	HR-1	Clamp Assembly complete with Lever & Spring	06004	2.
-25	HS-11	Strike	06004	10.
-26	Commercial	10-24 x 5/8" Lg Pan HD Slotted Machine Screw (Cad Plate)		4.
-27	AN 960-10	Flat Washer	88044	4.
-28	21FA-1024	Flex Loc Nut	56878	4.
-29	Commercial	4-40 x 7 1/16 Pan HD Slotted Screw (Cad plate)		20.
-30	AN 960-4	Flat Washer (.035 Thk x 5/17")	88044	20.
-31	21FA-440	Flex Loc Nut	56878	20.
-32	28594-1	Handle Assembly	31682	4.

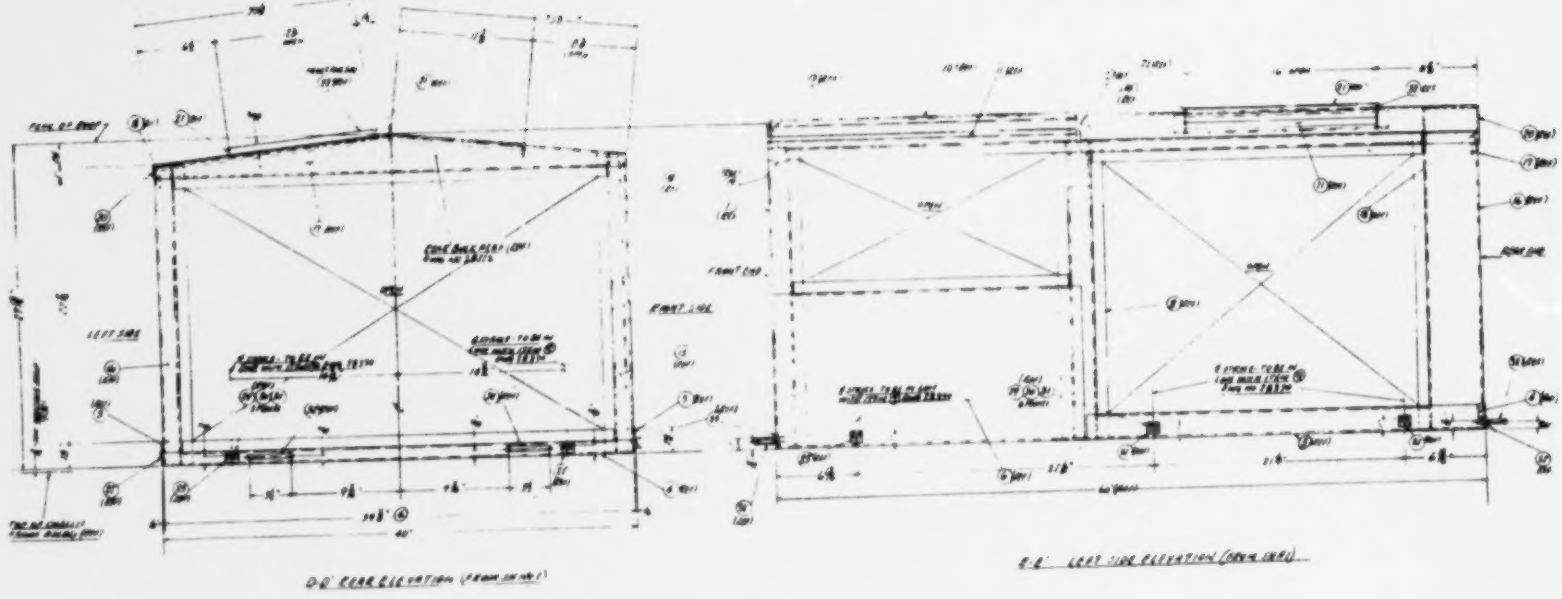

PEAK OF ROOF
LEFT SIDE
FRONT SIDE
OPEN
FRONT END
REAR END
OPEN
D-D' REAR ELEVATION
E-E' LEFT SIDE ELEVATION

Figure 25-B

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
26-	28440	Fuel Tank Assembly (18 Gallon Capacity)	31682	1.
-1	28440	Body, 12 Gauge 24" x 38½' H.R.S. Formed Sheet	31682	1.
-2	28440	Cover, 12 Gauge 22½ x 24 H.R.S. Sheet	31682	1.
-3	28440	End, 12 Gauge 9 5/8" x 22½" H.R.S. Sheet	31682	2.
-4	28440	Bent Angle, 12 Gauge 4 x 23" H.R.S.	31682	2.
-5	28440	Vent 3/8" OD x .035" Wall 4 9/16 Lg Steel Tube	31682	1.
-6	4350	Cap and Filler Neck Assembly	10203	1.
-7	28441	Fuel Level Sender Assembly D-385B-LH (Modified)	57733	1.
-8	Commercial	Screw, Round Head Self Tapping 8-32 x 3/8" Lg. Type F		4.
-9	28440	Gusset No. 12 gauge 2" Wide x 8" Long	31682	1.
-10	Commercial			
-11	28442	Gasket	31682	1.
-12	Commercial	1/8" S/40 Steel Pipe 9 3/4" Lg.		1.
-13	Commercial	Half Pipe Coupling ½" - 3000#		1.
-14	4GBTX-B	Female Brass Connector	45681	1.
-15	Commercial	Copper Tubing, Type "K" Soft Temper ¼" OD x .035" W		2 Ft.
-16	4CBTX-B	Male Brass 90° Elbow	45681	1.
-17	Commercial	1/8" S/40 Black Steel Pipe Nipple 3½" Lg Both Ends NPT		2.
-18	Commercial	1/8" 150# 90° Malleable Iron SCD 90° ELLS		2.

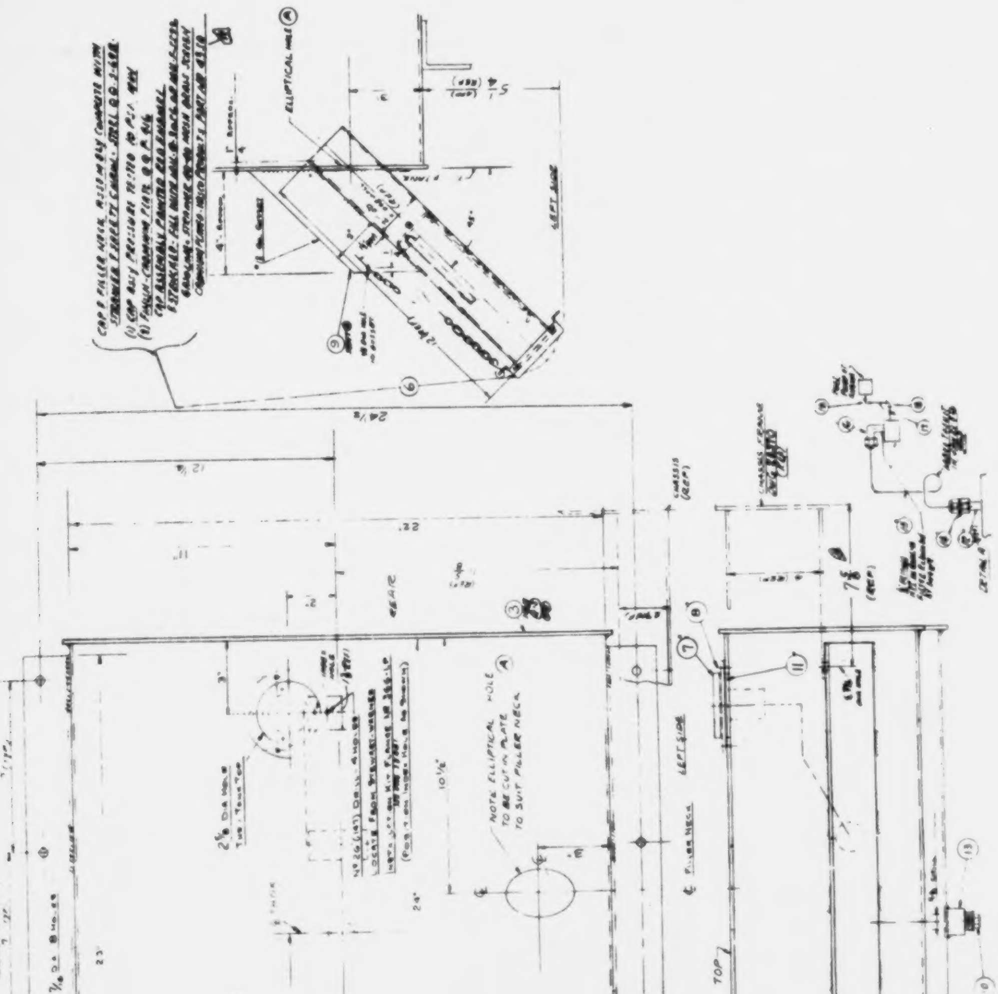

PLAN
TOP
LEFT SIDE
FRONT
REAR
NOTE ELLIPTICAL HOLE TO BE CUT IN PLATE TO SUIT FILLER NECK
ELLIPTICAL HOLE (A)
24 1/2
12 1/4
22
11
24
23
10 1/8
7 5/8
9 3/4
8 1/4
22 1/2
7/16 DRILL
2 3/8 DIA HOLE

Figure 26

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
27-	28370	Chassis Frame Assembly	31682	1.
-1	28532-1	Side Rail (Right) Hand Assembly	31682	1.
-2	28532-2	Side Rail (Left) Hand Assembly	31682	1.
-3	28533-1	End Plate (Front)	31682	1.
-4	28533-2	End Plate (Rear)	31682	1.
-5	28534-1	Chassis Support	31682	2.
-6	28534-2	Engine Support	31682	2.
-7	28534-3	Plate	31682	1.
-8	28534-4	Hand Brake Support	31682	1.
-9	HR-1	Clamp Assembly complete with Base, Lever, & Spring	06004	10.
-10	Commercial	10-24 x 5/8" Lg Pan Head Slotted Machine Screw (Cad Plate)		20.
-11	AN960-10	Flat Washer (i/16" Thk x 7/16" OD)	88044	20.
-12	21FA-1024	Flex Loc Nut	56878	20.
-13	Commercial	3/16" Thk x 3/4" Wide Weather Strip Dortite # 12-3650		17 Lin-Ft.
-14	28594-3	1/8" Thk Muffler Support		2.

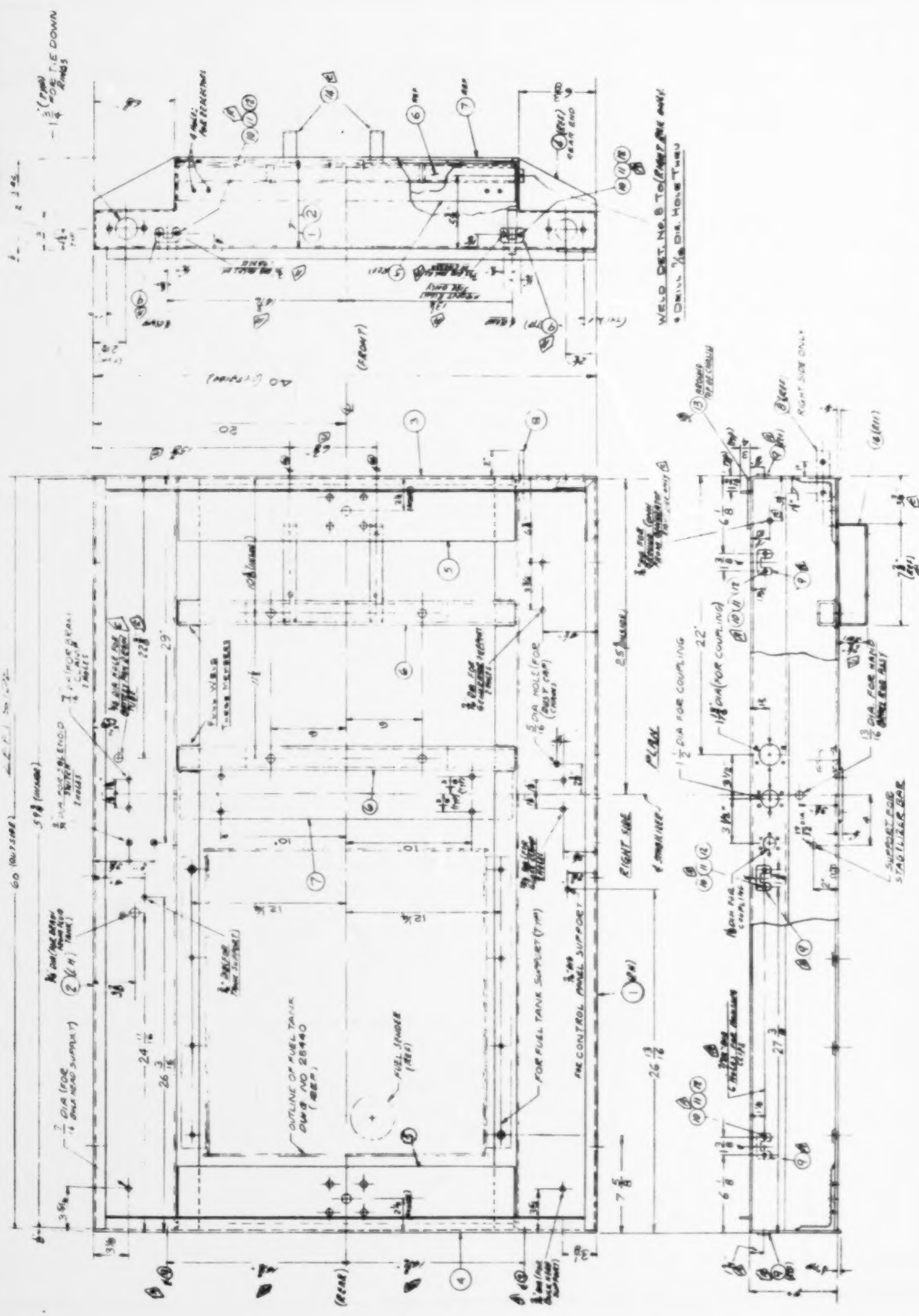

WELD DET. NO. 8 TO RIGHT SIDE ONLY
DRILL 9/16 DIA. HOLE THRU
1 3/4 (TYP) FOR TIE DOWN RINGS
40 (OUTSIDE)
(FRONT)
(REAR)
60 (OUTSIDE)
59 7/8 (INSIDE)
LEFT SIDE
RIGHT SIDE
PLAN
OUTLINE OF FUEL TANK DWG. NO 28440 (REF.)
FUEL SENDER
FOR FUEL TANK SUPPORT
FOR CONTROL PANEL SUPPORT
1 1/2 DIA FOR COUPLING
1 3/8 DIA (FOR COUPLING)
SUPPORT FOR STABILIZER BAR
ELEVATION
WELDED CONSTRUCTION

Figure 27

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
28-	28364	Control Panel Assembly	31682	1.
-1	27789	Fluid Pressure Gage Fig. 1853	61349	1.
-2	30593	Filter Pressure Gage Fig. 1813	61349	1.
-3	1536523	Tachometer, A.C.	70040	1.
-4	YE-2	Ammeter with Mounting Kit (With Engine)	66289	Ref.
-5	RS-11	Oil Pressure Gage (With Engine)	66289	Ref.
-6	378-P	Fuel Level Indicator with Mounting Kit	57733	1.
-7	378-P	Reserv oir Level Indicator with Mounting Kit	57733	1.
-8	TT-61-F3	Throttle Control with Engine	66289	Ref.
-10	6144- R3HC3-K	Outlet Selector Valve	89326	1.
-11	10SHD ¼"	Press Selector Valve	13174	1.
-12	AN929-4	Cap Assembly	88044	2.
-13	AN924-4	Bulkhead Nut	88044	1.
-14	30572	Fluid Temperature Gage with Bulb	61349	1.
-15	YM-911-9	H.P. Filter Light	72619	1.
-16	YM-911-9	L.P. Filter Light	72619	1.
-17	148-4BP	Gage Snubber Valve	86768	1.
-18	F-125	Reservoir Shut Off Valve 1"	13902	1.
-19	MV-861-S	Fluid By-Pass Valve	09990	1.
-20	1-1758-14R	Flow Control VL ½"	86768	1.
-21	1-1758-14R	Flow Control VL 3/4"	86768	1.
-22	1A32-R12A-6057	High Pressure Relief Valve	96259	1.
-23	MV461-S	Compensator Control Shut Off Valve	09990	1.
-24	408-02550-04 & 428-00014	Compensator Control (With Pump)	79470	Ref.
-25	J4624-17	Shock Mount	76005	6.
-26	28366-1	Control Panel Details Major Panel Frame Assembly	31682	1.
-27	28368	Control Panel Detail Minor Panel Frame Assembly	31682	1.
-28	28583-2	Fluid Tank Shut Off Valve (Handle Assembly)	31682	1.
-29	28583-1	Fluid Tank Shut Off Valve Bracket	31682	1.
-30	RP927-11	Oil Pressure Gauge Assembly with Engine	66289	Ref.
-31	MVK-400	Panel Mtg. Kit	09990	1.
-32	MVK-800	Panel Mtg. Kit	09990	1.
-33	AN832-4D	Bulkhead Union	88044	1.
-34	1535062	Mtg. Clamp	70040	1.
-35	120614	Nut	70040	2.
-36	120217	Washer	70040	2.

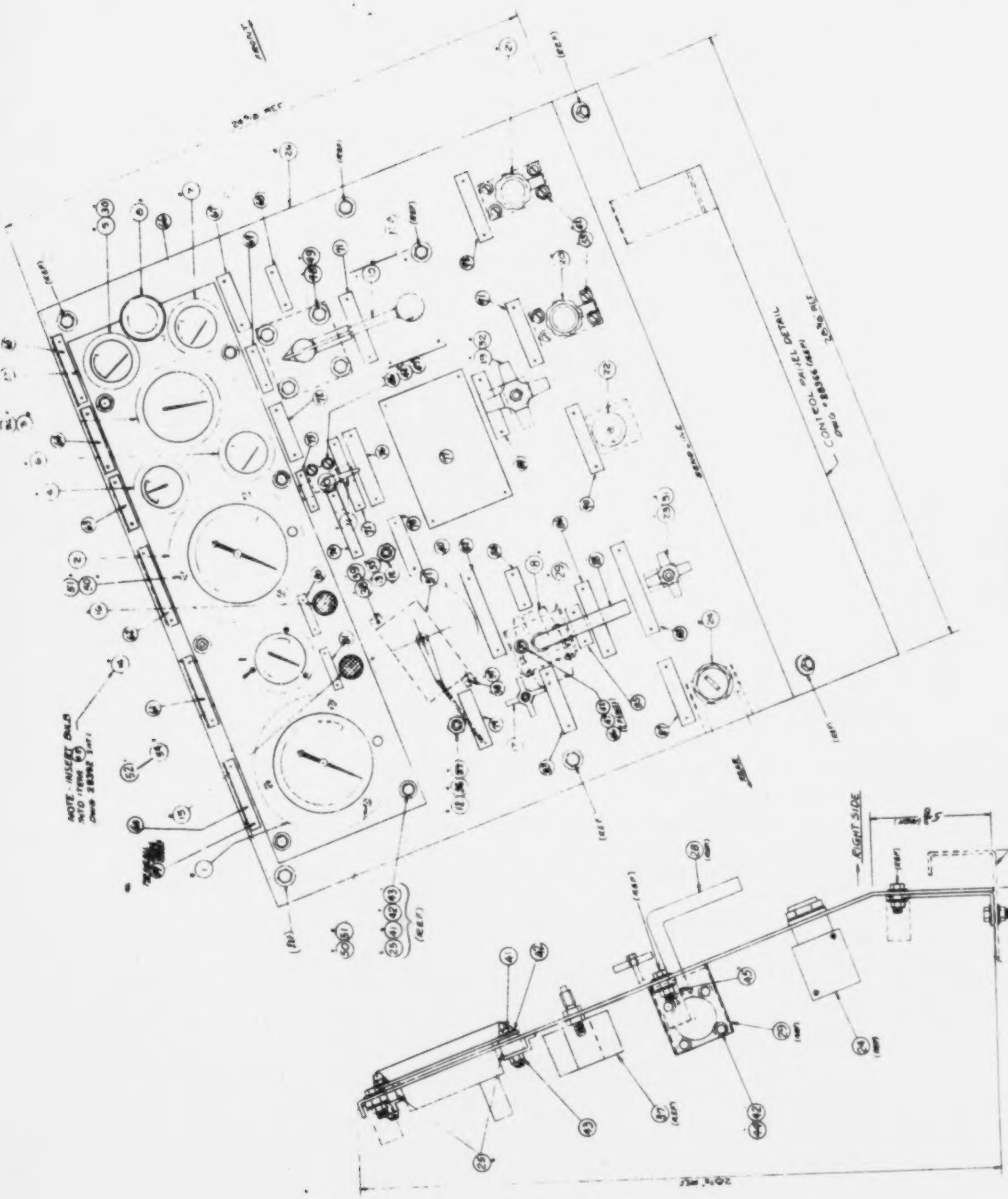

FRONT
CONTROL PANEL DETAIL
BEND LINE
RIGHT SIDE
(REF)
NOTE: INSERT BULB INTO ITEMS

Figure 28

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
28-37	28572	Flow Indicator Assembly	31682	1.
-38	32 FM-440	Flex Loc Nut	56878	2.
-39	Commercial	Flat Hd. Machine Screw 4-40 x 3/8" Lg (Cad Plate)		2.
-40	28541	Indicator Plate	31682	1.
-41	Commercial	¼-20 Cap Nut - Steel (Cad Plate)		6.
-42	AN936-A416	Lockwasher	88044	22.
-43	Type "A"			
-43	21FK-420	Flex Loc Nut	56878	6.
-44	Commercial	¼ - 20 x 3/4" Lg Hex Hd Cap Screw (Cad Plate)		4.
-45	AN380-3-4	Cotter Pin (3/32 Dia. x 1" Lg)	88044	1.
-46	Commercial	¼ - 20 x 3/4 Lg Pan Hd Slotted Cap Screw (Cad Plate)		4.
-47	21FA-420	Flex Loc Nut	56878	4.
-48	Commercial	3/8 - 16 x 3/4" Lg Hex Hd. Cap Screw (Cad Plate)		4.
-49	AN936-A616 Type "A"	Washer Internal Teeth .030 Thk x .692 OD	88044	4.
-50	Commercial	10-32 x 3/4" Lg Pan Hd. Slotted Screw (Cad Plate)		6.
-51	AN936-A1D	Washer Internal Teeth .022 Thk x 3/8" OD-	88044	6.
-52	Commercial	8-32 x ½" Lg Pan Hd. Slotted Screw (Cad Plate)		3.
-54	21FA-832	Flex Loc Nut	56878	3.
-55	Commercial	¼-20 x 5/8" Lg Pan Hd. Slotted Screw (Cad Plate)		8.
-56	MS24393D4	Bulkhead Union	88044	1.
-57	AN924-4	Bulkhead Nut	88044	1.
-58	6454458	Tachometer Cable 36" Lg	70040	1.
-59	Commercial	2-56 x ¼ Lg Pan Hd. Slotted Self Tapping Screw Type "F" (Cad Plate)		80.
-60	28625-26	Name Plate - (Fluid Pressure Gage)	31682	1.
-61	28625-27	Name Plate - (Fluid Temperature Gage)	31682	1.
-62	28625-34	Name Plate - (Filter Pressure Gage)	31682	1.
-63	28625-13	Name Plate - (Ammeter)	31682	1.
-64	28625-17	Name Plate (Tachometer)	31682	1.
-65	28625-28	Name Plate - (Oil Pressure Gage)	31682	1.
-66	28625-37	Name Plate - (Throttle Control)	31682	1.
-67	28625-31	Name Plate (Reservoir Level Indicator)	31682	1.
-68	28625-6	Name Plate - (½")	31682	1.
-69	28625-5	Name Plate - (3/4")	31682	1.
-71	28625-29	Name Plate (Outlet Selector VL)	31682	1.
-72	28625-14	Name Plate (Fuel Level Indicator)	31682	1.
-73	28625-1	Name Plate - (Gage)	31682	1.
-74	28625-25	Name Plate - (L.P. Filter Inlet)	31682	1.

Fig. & Index No.	Part No.	Description	Vendor	Qty/ Assy.
28-75	28625-30	Name Plate - (L.P. Filter Outlet)	31682	1.
-76	28625-32	Name Plate - (Pressure Selector VL)	31682	1.
-77	28637	Name Plate - (Hydraulic Circuit -Schematic) (See Fig. 10)	31682	1.
-78	28625-16	Name Plate - (Filter Pressure Gage Tap)	31682	1.
-79	28625-15	Name Plate - (Fluid Pressure Gage Tap)	31682	1.
-80	28625-3	Name Plate - (L.P.F.)	31682	1.
-81	28625-2	Name Plate - (H.P.F.)	31682	1.
-82	28625-35	Name Plate - (Fluid Flow Indicator)	31682	1.
-83	28625-18	Name Plate - (Gage Snubber VL)	31682	1.
-84	28625-4	Name Plate - (Open)	31682	1.
-85	28625-7	Name Plate - (Closed)	31682	1.
-86	28625-33	Name Plate - (Reservoir Shut Off VL)	31682	1.
-87	28625-19	Name Plate - (Compensator Control)	31682	1.
-88	28625-36	Name Plate - (Compensator Control Shut-Off VL)	31682	1.
-89	28625-20	Name Plate - (Fluid By-PassVL)	31682	1.
-90	28625-22	Name Plate - (High Pressure Relief VL)	31682	1.
-91	28625-23	Name Plate - (Flow Control VL ½")	31682	1.
-92	28625-24	Name Plate - (Flow Control VL 3/4")	31682	1.
-93	1815	Lamp	24446	2.
-94	28638-3	Name Plate - (Warning)	31682	1.
-95	653	Plug Snap Button H.H. Smith or Equiv.	31682	1.

APPENDIX A
MAINTENANCE ALLOCATION CHART

1. Purpose

The purpose of the maintenance allocation chart is to provide all activities with maintenance functions to be performed at each level of maintenance.

2. Definitions

a. Column 1, Group number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Functional group. Column 2 lists the noun names of components, assemblies, subassemblies, and modules on which maintenance is authorized.

c. Column 3, Maintenance functions. Maintenance functions will be limited to and defined as follows:

(1) Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

(2) Test. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

(3) Service. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

(4) Adjust. To rectify to the extent necessary to bring into proper operating range.

(5) Align. To adjust specified variable elements of an item to bring to optimum performance.

(6) Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

(7) Install. To set up for use in an operational environment such as an emplacement, site, or vehicle.

(8) Replace. To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

(9) Repair. To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, reveting, and strengthening.

(10) Overhaul. To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards prepared and published for the specific item to be overhauled.

(11) Rebuild. To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

(12) Symbols. The symbol, O, F, H, or D placed in the appropriate column indicates the level responsible for performing that particular maintenance function. The symbol "%%" which applies to organizational maintenance indicates that the particular maintenance function may be performed provided it is specifically authorized by the direct support maintenance officer. Use of the symbol will apply only to replacement of major assemblies and time-consuming operations which are within the capabilities of organization but over which control by the commodity commands is considered essential. In no case will the direct support maintenance officer require the accomplishment of a "%%" maintenance function by an organization or unit, and in no case will a "%%" function authorize stockage of parts at organizational level.

d. Column 4, Tools and equipment. This column will be used to specify, by code, those tools and test equipment required to perform the designated function.

e. Column 5, Remarks. Self-explanatory.

3. General

a. A maintenance function assigned to a maintenance level, which for any reason is beyond its capability, becomes the responsibility of the next higher maintenance level.

b. The authority to perform a maintenance function does not constitute authority to requisition or otherwise secure necessary repair parts as specified in current supply directives.

4. Deviations

a. Normally, there will be no deviations from the assigned maintenance level. In cases of operational necessity, a maintenance function assigned to a maintenance level may, on a one-time basis and at the request of the lower maintenance level, be authorized to the lower maintenance level by the maintenance officer of the level to which the function is assigned.

b. The furnishing of special tools, equipments, and the like, required by the lower maintenance level to perform this function, will be the responsibility of the level to which the function is assigned.

5. Additional Information

a. Changes in the maintenance allocation chart will be based on continuing evaluation and analysis by responsible technical personnel and on DA Form 2407 (Maintenance Request) received from field activities.

b. All maintenance prescribed herein will be performed in accordance with applicable publications.

c. In any instance of conflict with current tool and equipment list or current supply manuals, this maintenance allocation chart will be the final authority. Each such instance should be promptly reported by DA Form 2407.

MAINTENANCE ALLOCATION CHART
FOR
Test Stand, Hydraulic System, Gasoline Engine Driven, Type D-5B

(AR 310-3)

(1) GROUP NO	(2) FUNCTIONAL GROUP	(3) MAINTENANCE FUNCTION INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD	(4) TOOLS AND EQUIPMENT	(5) REMARKS
00	Test Stand, Aircraft, Hyd	O						O			D			
01	Electrical System													
	Battery	O	O	O					O					
	Ign Wire Assy	O	O	O					F	F				
	Generator	O	F	O					F	H				
	Voltage Regulator	O	F		F				F					
	Starter	O	F						F	H				
	Thermo Switch	O			F				F					
	Ammeter	O							F					
	Reservoir Level Ind	O							F					
	Fuel Level Ind	O							F					
02	Hydraulic System													
	Pump	O	F	F					F	H	H			
	Compensator Control	O	F		F									
	Valves	O			F				F	H	H			
	Fluid Reservoir	O		O					F					
	Lines, Tubing, Fitting Hose Assemblies	O												
	Low Pressure Filter Assy	O		O										
	High Pressure Filter Assy	O		O										
	Fluid Flow Indicator						*							
	Press. Gages	O					*		F					
	Temp Gage	O							F					
03	Engine													
	Cylinder Block and Comp.	H							H	H	H			
	Crankcase & Comp.	H		O					H	H	H			
	Governor	O			F				F	H				
	Fuel Pump	O		O					F	H				
	Fan Belt	O		O					O					
	Oil Filter Assy	O		O										
	Magneto	O	O	O	O				F					
	Spark Plugs	O	O	O	O				F					
	Fuel Strainer	O		O					F					
	Air Cleaner	O		O						F				
04	Miscellaneous													
	Fuel Tank	O		O					F	H				
	Tire	O		O					O	O				
	Tube	O		O					O	O				
	Wheels	O							F					

*Refer to TB 750-236 for calibration procedures.

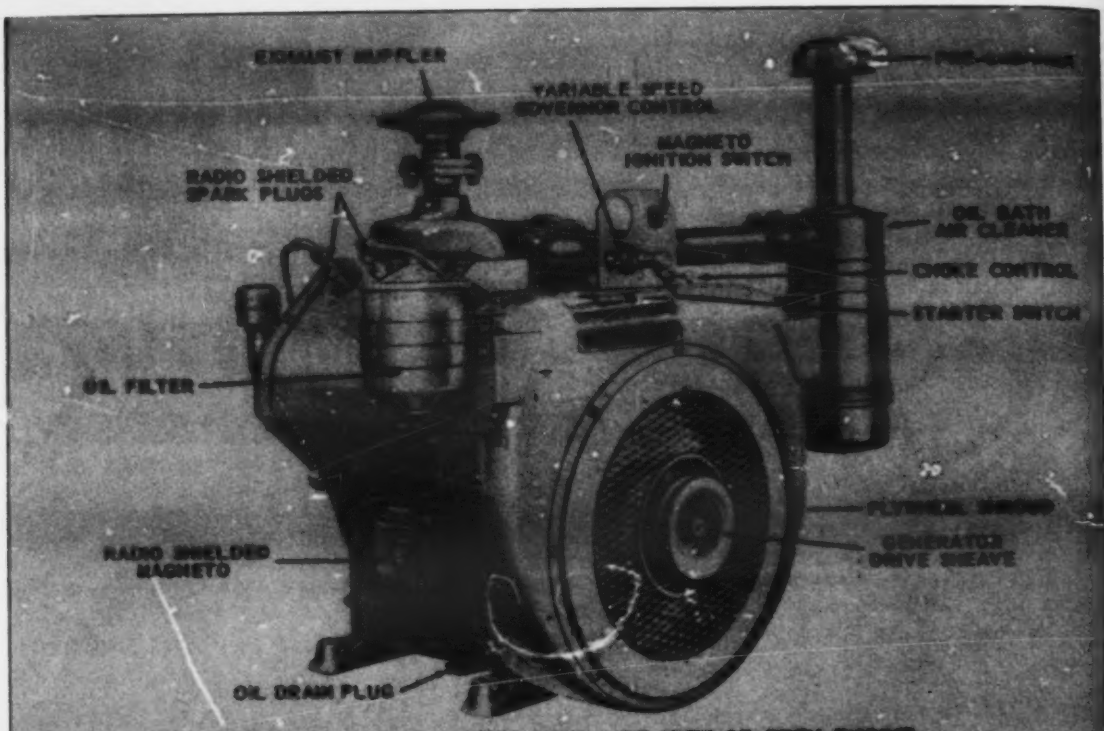
MAINTENANCE ALLOCATION CHART
FOR
Test Stand, Hydraulic System, Gasoline Engine Driven, Type D-5B

(AR 310-3)

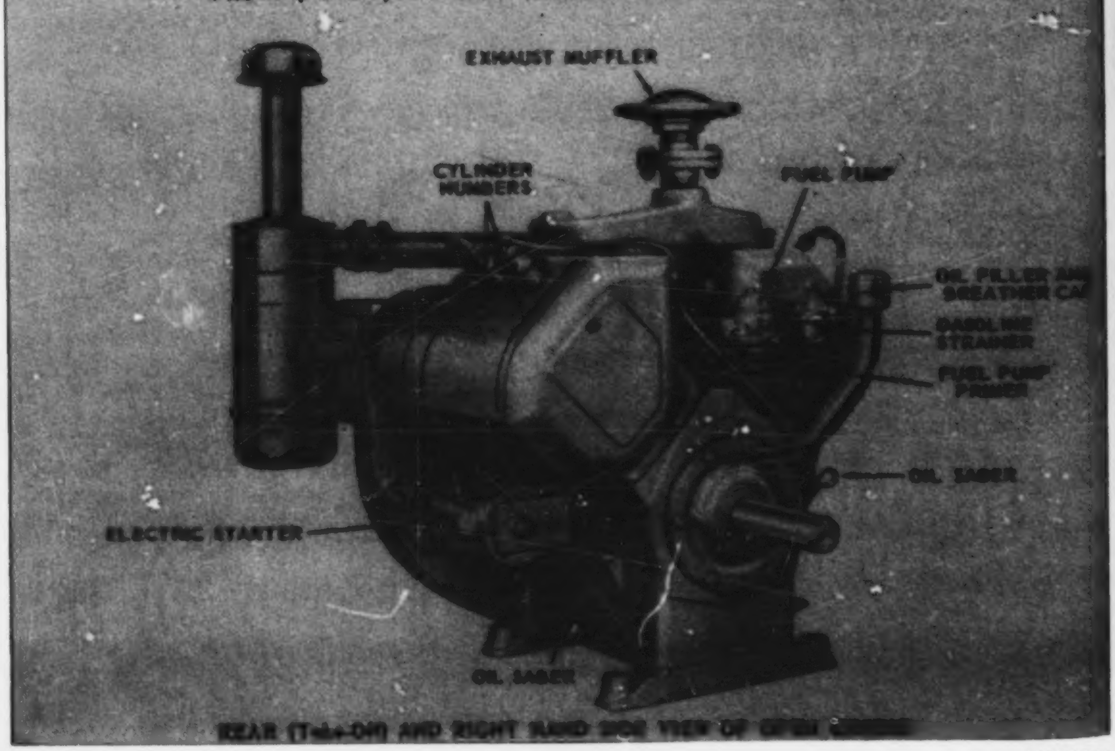
(1)	(2)	(3)											(4)	(5)
		MAINTENANCE FUNCTION												
GROUP NO	FUNCTIONAL GROUP	INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD	TOOLS AND EQUIPMENT	REMARKS
04	Miscellaneous (Cont'd)													
	Brake Drum and Hub	O		O					F					
	Brake Assembly	F	F		F				F					
	Axel and Steering Assy	F		O						F				
	Fuel Tank	O							F	H				
	Tire	O							O	O				
	Tube	O		O					O	O				

APPENDIX B

ENGINE OPERATION AND MAINTENANCE INSTRUCTIONS


EXHAUST MUFFLER
VARIABLE SPEED GOVERNOR CONTROL
MAGNETO IGNITION SWITCH
RADIO SHIELDED SPARK PLUGS
OIL BATH AIR CLEANER
CHOKE CONTROL
STARTER SWITCH
OIL FILTER
FLYWHEEL SHROUD
GENERATOR DRIVE SHEAVE
RADIO SHIELDED MAGNETO
OIL DRAIN PLUG

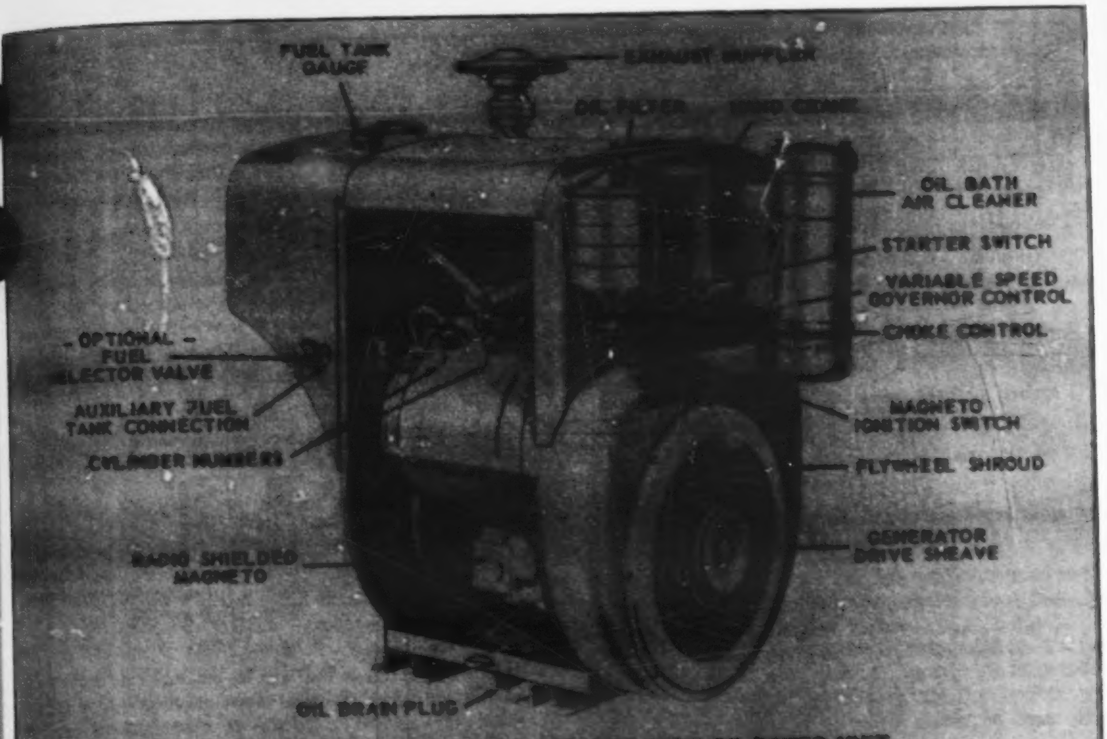
FRONT (Fan End) AND LEFT HAND SIDE VIEW OF OPEN ENGINE


EXHAUST MUFFLER
CYLINDER NUMBERS
FUEL PUMP
OIL FILLER AN
BREATHER CA
GASOLINE STRAINER
FUEL PUMP PRIMER
OIL SABER
ELECTRIC STARTER
OIL SABER

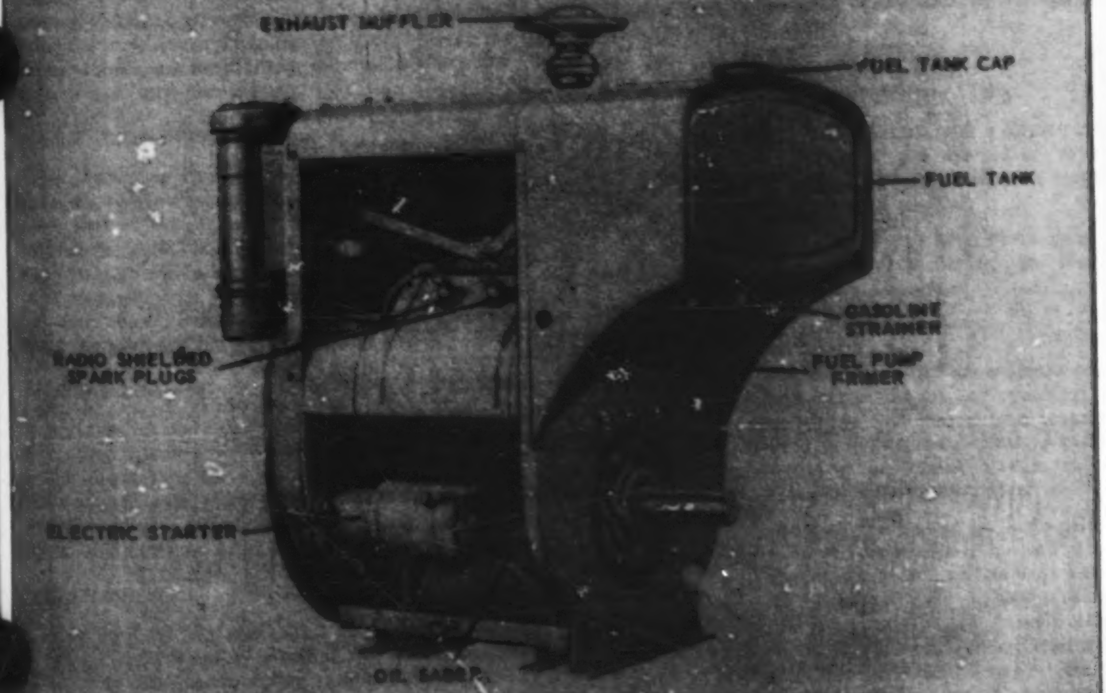
REAR (Take-Off) AND RIGHT HAND SIDE VIEW OF OPEN ENGINE

208061C-A
208063C-A

Fig. 1
MODEL MVG4D OPEN ENGINE


FUEL TANK GAUGE
EXHAUST MUFFLER
OIL FILTER
HAND CRANK
OIL BATH AIR CLEANER
STARTER SWITCH
VARIABLE SPEED GOVERNOR CONTROL
CHOKE CONTROL
- OPTIONAL - FUEL SELECTOR VALVE
AUXILIARY FUEL TANK CONNECTION
CYLINDER NUMBERS
MAGNETO IGNITION SWITCH
FLYWHEEL SHROUD
GENERATOR DRIVE SHEAVE
RADIO SHIELDED MAGNETO
OIL DRAIN PLUG

FRONT (Fan End) AND LEFT HAND SIDE VIEW OF POWER UNIT


EXHAUST MUFFLER
FUEL TANK CAP
FUEL TANK
GASOLINE STRAINER
FUEL PUMP PRIMER
RADIO SHIELDED SPARK PLUGS
ELECTRIC STARTER
OIL SUMP

REAR (Take-Off) AND RIGHT HAND SIDE VIEW OF POWER UNIT

203071C-A
203072C-A

Fig. 2
MODEL MVG4D POWER UNIT

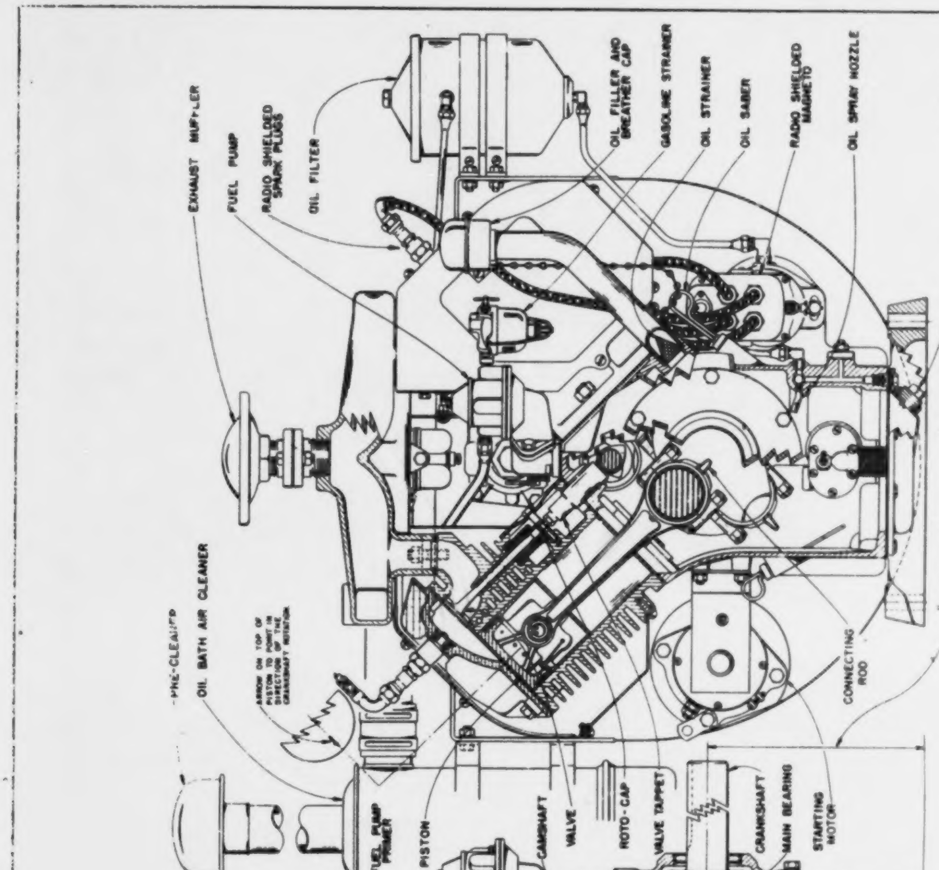

EXHAUST MUFFLER
FUEL PUMP
RADIO SHIELDED SPARK PLUGS
OIL FILTER
OIL FILLER AND BREATHER CAP
GASOLINE STRAINER
OIL STRAINER
OIL SABER
RADIO SHIELDED MAGNETO
OIL SPRAY NOZZLE
OIL DRAIN PLUG
PRE-CLEANER
OIL BATH AIR CLEANER
ARROW ON TOP OF PISTON TO POINT IN DIRECTION OF THE CRANKSHAFT ROTATION
CONNECTING ROD
9½" FOR MIL-E-11275-C B-B SPEC ENGINES
9" FOR MIL-E-11275-A SPEC
FUEL PUMP PRIMER
PISTON
CAMSHAFT
VALVE
ROTO-CAP
VALVE TAPPET
CRANKSHAFT
MAIN BEARING
STARTING MOTOR
GOVERNOR ADJUSTING SCREW
MAGNETO STOP SWITCH
GOVERNOR ASSEMBLY
CARBURETOR
OIL PUMP ASSEMBLY
FAN-FLYWHEEL
HAND CRANK
STARTER SWITCH
CHOKE CONTROL
CAMSHAFT THRUST PLUNGER
MAIN BEARING

Fig. 3
CROSS SECTION OF MODEL MVG4D ENGINE

GENERAL INFORMATION AND DESIGN

Wisconsin engines are of the *four cycle* type, in which each of the four operations of *suction, compression, expansion* and *exhaust* requires a complete stroke. This gives one power stroke per cylinder for each two revolutions of the crankshaft.

COOLING

Cooling is accomplished by a flow of air, circulated over the cylinders and heads of the engine, by a combination fan-flywheel encased in a sheet metal shroud. The air is divided and directed by ducts and baffle plates to insure uniform cooling of all parts.

> ***Never operate an engine with any part of the shrouding removed, because this will retard the air cooling.***

CARBURETOR

The proper combustible mixture of gasoline and air is furnished by a balanced carburetor, giving correct fuel to air ratios for all speeds and loads.

IGNITION

The spark for ignition of the fuel mixture is furnished by a high tension *radio shielded* magneto driven off the timing gears at crankshaft speed. The magneto distributor *rotor turns at half-engine speed.* The magneto is fitted with an impulse coupling, which makes possible a powerful spark for easy starting. Also, the impulse coupling automatically retards the timing of the spark for starting, thus eliminating danger of a kick-back from the engine when cranking.

LUBRICATION SYSTEM

A gear type pump supplies oil to four nozzles which direct oil streams against fins on the connecting rod caps. Part of the oil enters the rod bearing through holes in the rods, and the balance of the oil forms a spray or mist which lubricates the cylinders and all other internal parts of the engine. An external oil line from the oil header tube in the crankcase lubricates the governor and gear train, *see Fig. 4.*

GOVERNOR

A governor of the centrifugal flyball type controls the engine speed by varying the throttle opening to suit the load imposed upon the engine. All engines are equipped with either *fixed speed* governors, a *variable speed regulator* to control the governed speed of the engine, or an *idle control.*

ROTATION

The rotation of the crankshaft is clockwise when viewing the flywheel or cranking end of the engine. This gives *counter-clockwise rotation* when viewing the power take-off end of the crankshaft. The flywheel end of the engine is designated the *front end,* and the power take-off end, the *rear end* of the engine.

HORSEPOWER

R.P.M.	HORSEPOWER
1400	24.5
1600	27.6
1800	30.2
2000	32.4
2200	34.5
2400	36.0

The horsepower given in the chart is for an atmospheric temperature of 60° Fahrenheit, at sea level, and at a Barometric pressure of 29.92 inches of mercury.

For each inch lower Barometer reading deduct 3½% from above horsepower.

For each 10° higher temperature there will be a reduction in horsepower of 1%.

For each 1000 ft. altitude above sea level there will be a reduction in horsepower of 3½%.

The friction in new engines cannot be reduced to the ultimate minimum during the regular block test, but engines are guaranteed to develop at least 85 per cent of maximum power when shipped from the factory. The power will increase, as friction is reduced, during a few days of operation. The engine will develop at least 95% of power shown on chart when friction is reduced to a minimum.

For continuous operation allow 25% of horsepower shown, as a safety factor.

INSTRUCTIONS FOR STARTING AND OPERATING

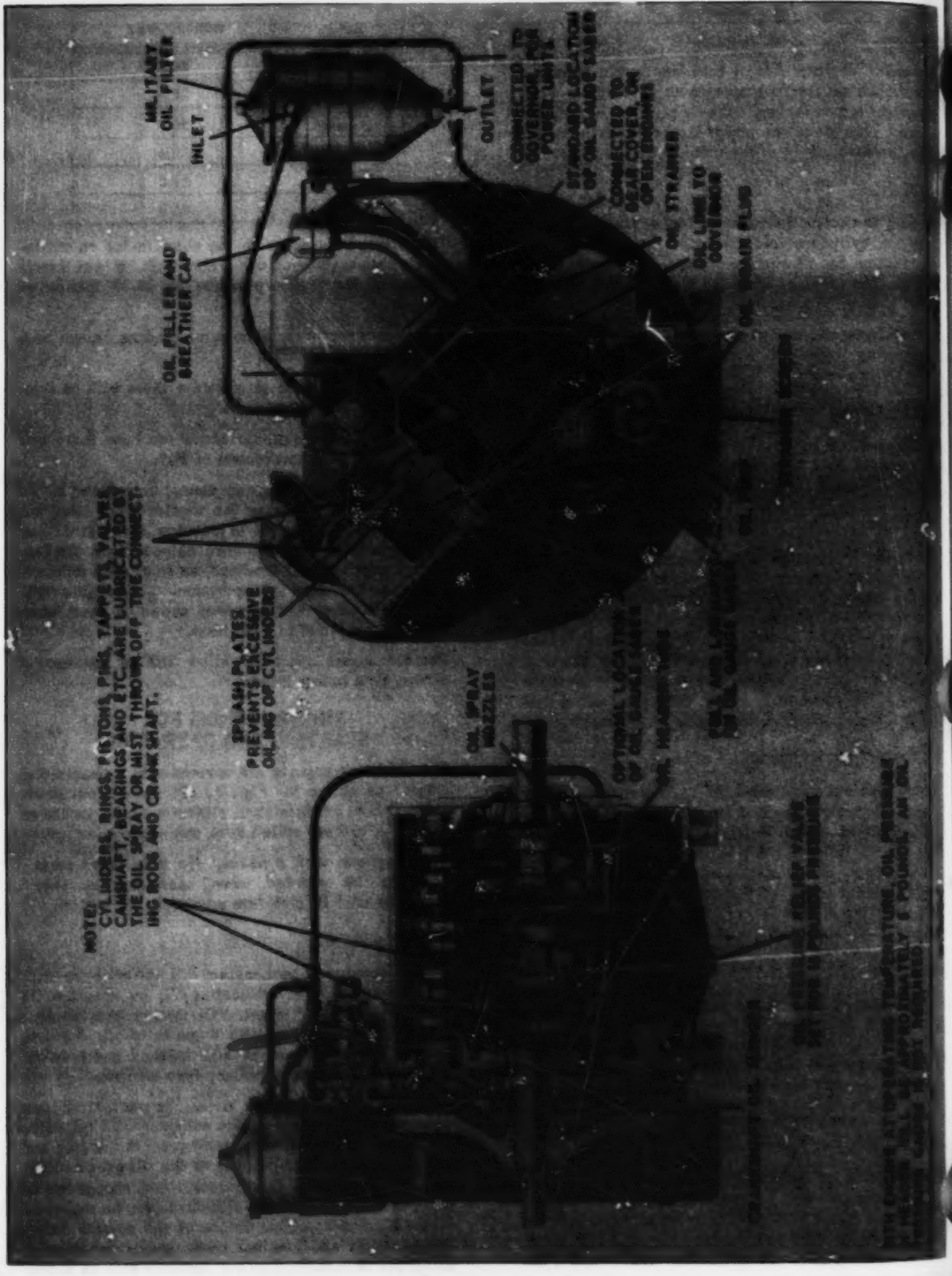
Some of these engines are covered with a sheet metal house, as shown in *Fig. 2,* and are called *power units.* Others are furnished without a house, as shown in *Fig. 1,* and are called *open engines.*

> ***On engines with a house, the side doors must always be removed when operating, so that cooling air will circulate properly.***

LUBRICATION

Before starting a new engine, fill the oil base with the correct grade of lubricating oil, as specified in the "Grade of Oil" chart. Fill through the breather tube shown in *Fig. 5,* with *6* quarts of oil; *5* quarts for the crankcase and an additional *1* quart is required if engine has a *Military type oil filter.*

After the engine has been *run-in,* as per instructions on inside of front cover, the oil lines and oil filter will have been filled with oil. Shut off the engine and check the oil level by means of the *oil gauge saber,* as shown in *Fig. 6.* If necessary, add enough oil to bring the level up to the *full mark.* An oil saber is located on the left hand side of the engine below the oil filler and breather tube, and if specified a saber can be furnished on the opposite side as shown in *Fig. 6.*



NOTE:
CYLINDERS, RINGS, PISTONS, PINS, TAPPETS, VALVES CAMSHAFT, BEARINGS AND ETC. ARE LUBRICATED BY THE OIL SPRAY OR MIST THROWN OFF THE CONNECTING RODS AND CRANKSHAFT.
SPLASH PLATES PREVENTS EXCESSIVE OILING OF CYLINDERS
OIL FILLER AND BREATHER CAP
MILITARY OIL FILTER
INLET
OUTLET
CONNECTED TO GOVERNOR, FOR POWER UNITS
STANDARD LOCATION OF OIL GAUGE SABER
CONNECTED TO GEAR COVER, ON OPEN ENGINES
OIL STRAINER
OIL LINE TO GOVERNOR
OIL DRAIN PLUG
OIL PUMP
STRAINER SCREEN
FULL AND LOW MARKS ON OIL GAUGE SABER
OIL SPRAY NOZZLES
OPTIONAL LOCATION OF OIL GAUGE SABER
OIL HEADER TUBE
CRANKSHAFT OIL
OIL PRESSURE RELIEF VALVE SET FOR POUNDS PRESSURE
WITH ENGINE AT OPERATING TEMPERATURE, OIL PRESSURE IN HEADER WILL BE APPROXIMATELY 5 POUNDS. AN OIL PRESSURE GAUGE IS NOT REQUIRED.

Fig. 4
LUBRICATION SYSTEM

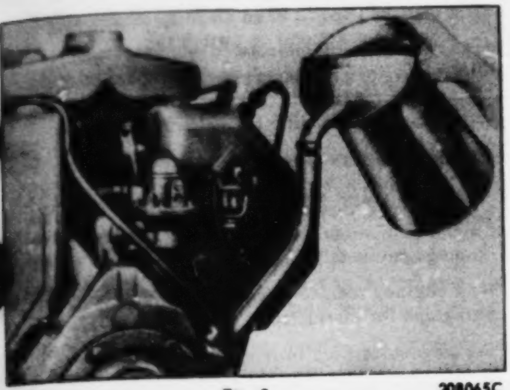


Fig. 5 208065C

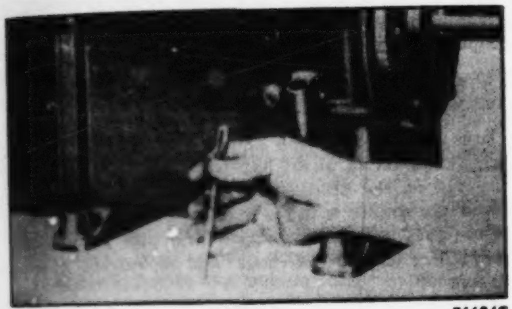


Fig. 6 76694C

GRADE OF OIL CHART

SEASON OR TEMPERATURE	GRADE OF OIL	MILITARY SPECIFICATION
Spring, Summer or Autumn + 120°F to + 40°F	SAE 30	MIL-L-2104
Winter + 40°F to – 10°F	SAE 10	MIL-L-2104
Winter – 10°F to – 65°F	Oil, Engine, Sub Zero	MIL-L-10295
Crankcase Capacity		5 Qts.
Oil Filter and Oil Lines		1 Qt.

GRADE OF OIL

Follow summer recommendations in winter if engine is housed in warm building.

Check oil level every 8 hours of operation.

The old oil should be drained and fresh oil added after every 50 hours of operation.

To drain oil, remove drain plug illustrated in *Fig. 4.* Oil should be drained while engine is hot, as it will then flow more freely.

OIL PRESSURE

At engine operating temperature the oil pressure will be about 4 to 5 pounds per square inch. Due to this low pressure system an oil pressure gauge is not required. When the engine is cold the pressure will be higher, and a relief valve is fitted to the oil pump so that under these conditions the maximum pressure will be limited to 15 pounds.

OIL FILTER

A ***Military oil filter,*** as illustrated in *Fig. 4,* is furnished on both the open engine and power unit, built to ***MIL-E-11275-C*** and ***MIL-E-11275-B*** specifications.

The oil filtering cartridge should be replaced after every 100 hours of operation, under normal operating conditions. If engine is operated under extreme dusty conditions, replace cartridge after every oil change.

Refer to accessory section in the rear of the manual for further service instruction and replacement parts.

A ***Wisconsin*** commercially used ***by-pass*** type oil filter is used on ***MIL-E-11275-A*** spec engines. This filter is mounted on the left hand side of the crankcase, next to the magneto, as illustrated in parts list section, *Fig. 54.*

The filter cartridge should be replaced after every other oil change. If operating conditions are extremely dusty, replace cartridge after every oil change. Part number is located on top of cartridge, for replacement identification.

FUEL

These engines can be furnished with a gravity feed tank mounted above the level of the carburetor, or with a side mount tank. In all cases a fuel pump is furnished on the engine.

The fuel tank should be filled with a good quality of gasoline free from dirt and water. Some of the poorer grades of gasoline contain gum which will deposit on valve stems, piston rings, and in various small passages in the carburetor and thus cause serious trouble in operating, and in fact might prevent the engine from operating at all.

Use gasoline that conforms to Military Specifications MIL-G-3056 or MIL-F-5572.

FUEL PUMP

All engines are equipped with a fuel pump. When starting a new engine for the first time, or when engines

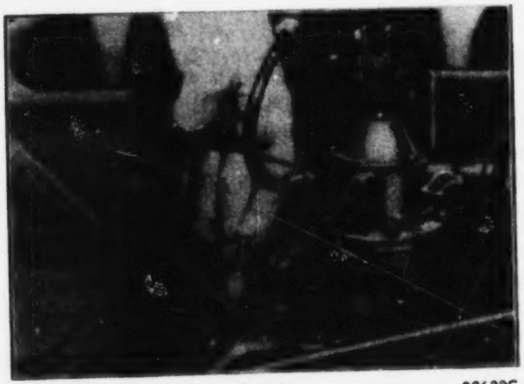


Fig. 7 83622C

have been out of operation for a while, the hand primer lever on the fuel pump adapter should be used to pump gasoline into the dry carburetor. When priming, a distinct resistance of the fuel pump diaphragm should be felt when moving the hand lever back and forth. If this is not the case, the engine should be turned over a revolution so that the fuel pump cam will be rotated from its upper position, which would prevent priming. The hand lever should be given about 20 to 30 strokes, depending on how much fuel, if any, there is in the carburetor float chamber, *see Fig. 7.* When the carburetor is full, the hand primer lever will move more easily.

GASOLINE STRAINER

The gasoline strainer is very necessary to prevent sediment, dirt and water from entering the carburetor and causing trouble or even complete stoppage of the engine. The strainer bowl should be inspected frequently, and cleaned if dirt or water are present. To remove bowl, first shut off fuel valve, then loosen the knurled nut below bowl and swing the wire bail to one side. After cleaning bowl and screen, reassemble the parts, being sure the gasket is in good condition; otherwise use a new gasket. *See Fig. 8,* which shows the gasoline strainer mounted to the fuel tank of a power unit. On open engines, the strainer is mounted to the inlet of the fuel pump.

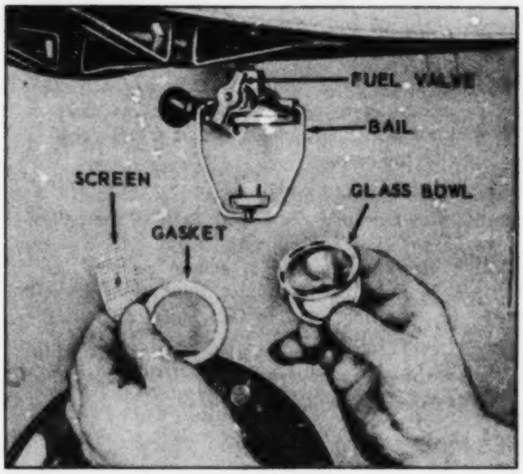


Fig. 8 71051C

IGNITION SWITCH

On ***MIL-E-11275-C*** spec engines, a ***positive action*** ground switch is located at the bottom of the magneto end cover. The switch button is ***pulled out*** when starting the engine and ***pushed in*** for stopping. Engines built to the ***MIL-E-11275-B*** and ***MIL-E-11275-A*** specifications have a spring type switch button which is always in the ***on*** or running position, and must be depressed and held down until engine stops.

On power units, the magneto ignition switch is on the outside of the house panel, at the flywheel end. *See bottom view of Fig. 1.* When starting or stopping engine, follow instructions on switch tag.

STARTING

STARTING PROCEDURE for -25°F. to +120°F.

1. Check crankcase oil level.
2. Open fuel valve after checking gasoline supply in tank.
3. Disengage clutch (if applicable).
4. New engines require priming; refer to "Fuel Pump" paragraph for instructions.
5. Set magneto switch in running position.
6. If engine is equipped with a variable speed control, set throttle about 1/2 open; fixed speed governors require no setting, and over center idle control should be in full load position.
7. Close carburetor choke by pulling choke button to extreme out position.
8. Turn engine over one or two revolutions. Push choke button in about half-way and then pull up briskly on the starting crank. ***Do not*** attempt to ***spin*** the engine with the starting crank. If the engine does not start on the first pull up of the crank, re-engage the crank and repeat the operation.
   With electric starting motor; depress starter button switch. The engine should start within 2 or 3 crankshaft revolutions. If starting difficulty is experienced, do not *'grind away'* at the starter, but rather attempt short intermittant starting cycles.
9. After engine starts, push in choke button as required for smooth running. Choke must be completely open when engine is warmed up.

If flooding should occur, open choke fully, by pushing choke button in and continue cranking. More cranking is necessary when starting in cold temperatures than in warm.

If the engine will not start, check to determine if fuel is being supplied to the engine. Also check ignition wire contacts at magneto and spark plugs. *See Starting Difficulties, Page 14.*

If the starter is *'dead'* or is unable to turn the engine over, check battery and cable connections at the battery, starting motor, and starting switch; also check for broken or frayed cables. Test starting switch and starting motor and replace or repair if necessary.

STARTING at -65°F. to -25°F.

1. Apply starting aids.
2. Follow instructions for starting at -25°F. to +120°F.
3. Operate engine at 1800 R.P.M. without load for a minimum of 10 minutes.
4. Increase speed to rated R.P.M. of engine for an additional 5 minutes before applying load.

WARM-UP PERIOD

The engine should be allowed to warm up to operating temperature before the load is applied. This requires only a few minutes of running the engine at a moderate speed.

Racing an engine or gunning it, to hurry the warm-up period, ***is very destructive*** to the polished wearing surfaces on pistons, rings, cylinders, bearings, etc., as the proper oil film on these various surfaces cannot be established until the oil has warmed up and become sufficiently fluid. This is especially important on new engines and in cool weather.

Racing an engine by disconnecting the governor, or by doing anything to interfere with the governed control engine speed, ***is extremely dangerous.*** Quite naturally the operator of the engine desires to get all possible power out of an engine, and the engine manufacturer does his best to supply this want, but if all of this power is used merely to speed up the engine, without any load being imposed upon it, dangerously high speeds will result.

The governor is provided as a means for controlling the engine speed to suit the load applied, and also as a safety measure to guard against excessive speeds, which not only overstrain all working parts, but which might cause wrecking of the engine and possible injury to bystanders.

All parts of the engine are designed to safely withstand any speeds which might normally be required, but it must be remembered that the stresses set up in rotating parts increase with the square of the speed. That means that if the speed is doubled, the stresses will be quadrupled, and if the speeds are trebled, the stresses will be nine times as great.

Strict adherence to the above instructions cannot be too strongly urged, and greatly increased engine life will result as a reward for these easily applied recommendations.

STOPPING ENGINE

Depress magneto switch to stop engine. With spring button ground switch, hold stop button in depressed position until engine stops.

If the engine has been running hard and is hot, do not stop it abruptly from full load, but remove the load and allow engine to run idle at 1000 to 1200 R.P.M. for three to five minutes, depending on how hot the engine has been. This will reduce the internal temperature of the engine much faster, minimize valve warping, and of course the external temperature, including the manifold and carburetor will also reduce faster, due to air circulation from the flywheel.

Two main troubles resulting from abrupt shutting off a hot engine are ***vapor lock*** and ***dieseling.*** Vapor lock will prevent the flow of fuel in the fuel lines and carburetor passages, which will result in hard starting of the engine. This can be overcome by choking the engine when cranking or waiting until the engine has cooled off sufficiently to overcome the vapor lock. Dieseling, is caused by the carbon and lead deposits in the cylinderhead being heated up to such an extent that they continue to fire the engine and keep it running after the ignition has been shut off. By idling the engine, as previously mentioned. the carbon and lead deposits cool off, break up and will blow out thru the exhaust. If engine should continue to diesel, by suddenly opening up the throttle wide and at the same time shutting off the ignition, the engine will stop.

AIR CLEANER

The air cleaner is an essential accessory, filtering the air entering the carburetor, and thereby prolonging the life of the engine.

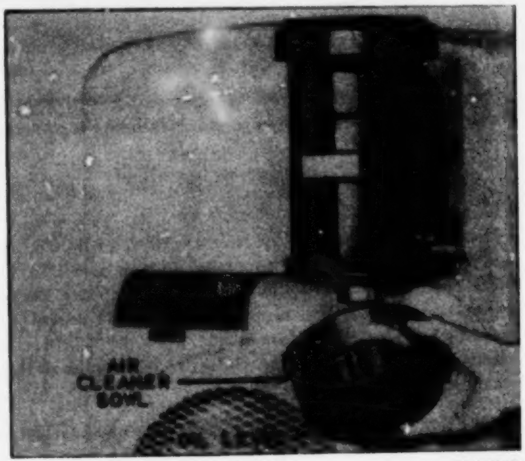


Fig. 9 104577C

Remove the bowl from the air cleaner, as illustrated in *Fig. 9.* Fill the bowl to oil level line with the same grade of oil as used in the crankcase. Detailed instructions are printed on the air cleaner.

The air cleaners must be serviced frequently, depending on the dust conditions where the engines are operated. When the oil in the bowl becomes dirty, it should be removed and replaced with new oil. This servicing will vary from a few days of operation in comparatively clean conditions to twice a day in dusty conditions.

> ***Operating the engine under dusty conditions without oil in the air cleaner or with dirty oil, may wear out cylinders, pistons, rings and bearings in a few days time, and result in costly repairs.***

At least once a year the air cleaner should be removed from the engine, and the element which is not removable, should be washed in a solvent to clean out the accumulated dust and dirt.

If a collector type pre-cleaner is used on the top of the air cleaner, *Fig. 10,* it should be emptied of accumulated dirt frequently, depending on dust conditions. ***Do not use oil or water in pre-cleaner. This should be kept dry.***

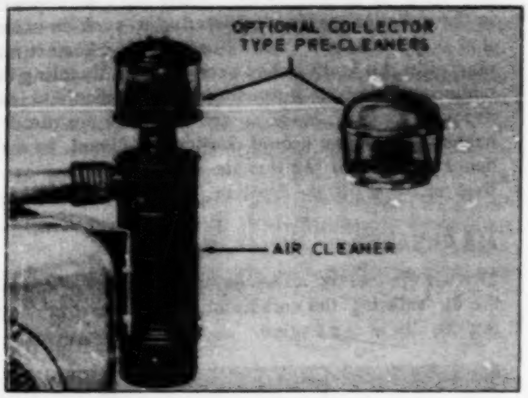

OPTIONAL COLLECTOR TYPE PRE-CLEANERS
AIR CLEANER

Fig. 10 217102C

Daily attention to the air cleaner and pre-cleaner is one of the most important considerations in prolonging engine life.

CARBURETOR ADJUSTMENT

The main metering jet in the carburetor is of the fixed type, and therefore requires no adjustment. The idle needle should be adjusted for best low speed operation, while carburetor throttle is closed by hand. For further information, refer to Carburetor Manufacturer's Instruction Bulletin in the rear of this manual.

MAGNETO BREAKER POINT ADJUSTMENT

The magneto ***breaker point gap*** is ***.015 inch*** at full separation. If the ignition spark becomes weak after continued operation, the breaker points may have to be readjusted, resurfaced or replaced. Remove the magneto end cover in order to examine the points. If there is evidence of pyramiding or pitting, the points should be resurfaced with a small tungsten file.

Points that are badly worn or pitted should be replaced. Check breaker point gap by rotating the crankshaft with the starting crank, (this also rotates the magneto), until the breaker points are wide open. The opening or gap should then be measured with a feeler gauge as shown in *Fig. 11.*

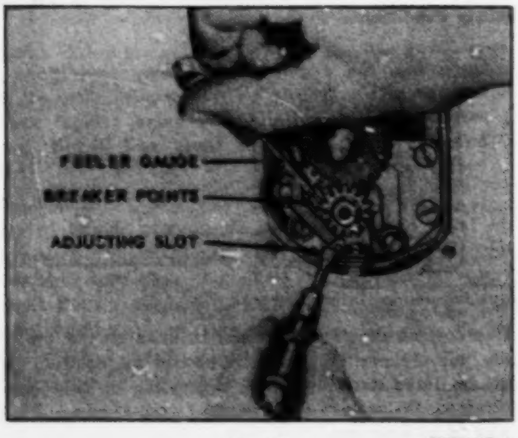

FEELER GAUGE
BREAKER POINTS
ADJUSTING SLOT

Fig. 11 208070C-A

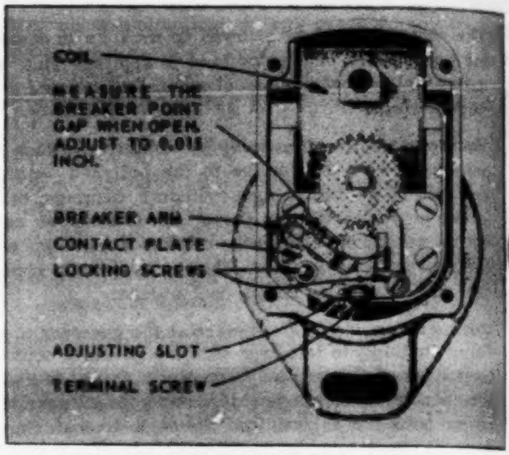

COIL
MEASURE THE BREAKER POINT GAP WHEN OPEN. ADJUST TO 0.015 INCH.
BREAKER ARM
CONTACT PLATE
LOCKING SCREWS
ADJUSTING SLOT
TERMINAL SCREW

Fig. 12, OPEN END VIEW OF MAGNETO

Adjust breaker points as follows: First loosen the two ***locking screws*** on the ***contact plate*** enough so that the plate can be moved. Insert the end of a small screw driver into the ***adjusting slot*** at the bottom of the ***contact plate*** and open or close the contacts by moving the plate until the proper opening is obtained, *see Fig's. 11 and 12.* After tightening the locking screws, recheck breaker point gap to make sure it has not changed.

Replace magneto end cover and gasket carefully so that they seal properly. For further information see Fairbanks-Morse magneto maintenance instructions in the rear section of this manual.

MAGNETO IGNITION SPARK

If difficulty is experienced in starting the engine or if engine misses firing, the strength of the ignition spark may be tested by disconnecting the No. 1 igni-

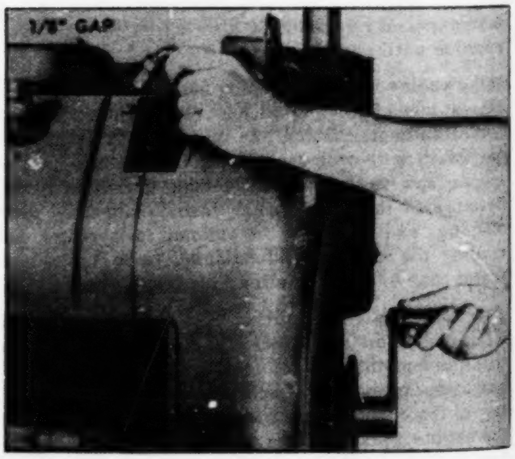
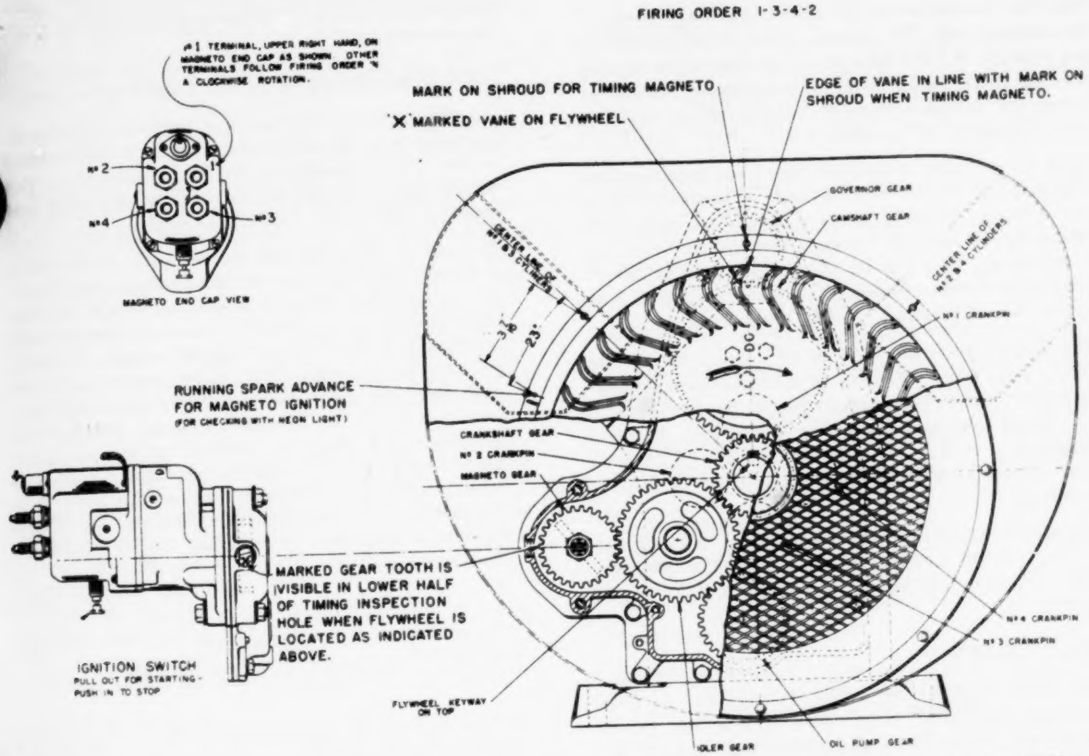


Fig. 13 208066C


FIRING ORDER 1-3-4-2
#1 TERMINAL, UPPER RIGHT HAND, ON MAGNETO END CAP AS SHOWN. OTHER TERMINALS FOLLOW FIRING ORDER IN A CLOCKWISE ROTATION.
1
Nº 2
Nº 4
Nº 3
MAGNETO END CAP VIEW
MARK ON SHROUD FOR TIMING MAGNETO
'X' MARKED VANE ON FLYWHEEL
EDGE OF VANE IN LINE WITH MARK ON SHROUD WHEN TIMING MAGNETO.
GOVERNOR GEAR
CAMSHAFT GEAR
CENTER LINE OF Nº 1 & 3 CYLINDERS
CENTER LINE OF Nº 2 & 4 CYLINDERS
3 1/8
23°
DC
Nº 1 CRANKPIN
RUNNING SPARK ADVANCE FOR MAGNETO IGNITION
(FOR CHECKING WITH NEON LIGHT)
CRANKSHAFT GEAR
Nº 2 CRANKPIN
MAGNETO GEAR
MARKED GEAR TOOTH IS VISIBLE IN LOWER HALF OF TIMING INSPECTION HOLE WHEN FLYWHEEL IS LOCATED AS INDICATED ABOVE.
IGNITION SWITCH
PULL OUT FOR STARTING - PUSH IN TO STOP
FLYWHEEL KEYWAY ON TOP
Nº 4 CRANKPIN
Nº 3 CRANKPIN
IDLER GEAR
OIL PUMP GEAR

tion cable from the spark plug and holding the terminal 1/8 inch away from the air shroud or any other metal part of the engine, as shown in *Fig. 13.* Turn the engine over slowly by the starting crank two complete revolutions and watch for the spark discharge which should occur during the cycle, at the instant the impulse coupling on the magneto snaps. Repeat this check with each of the other ignition cables. If there is a weak spark, or none at all, check breaker point opening as mentioned in preceding paragraph under *"Magneto Breaker Point Adjustment"*. If this does not remedy the trouble, it may be necessary to install a new condenser. See Magneto Manufacturer's Maintenance Instructions in the rear of this manual.

MAGNETO TIMING

The magneto is properly timed to the engine at the factory, but if for any reason it is necessary to retime the magneto, it can be done in the following manner:

First remove the screen over the flywheel air intake opening by taking out the screws holding the screen in place. This will expose the ***timing marks*** on flywheel and shroud. *See Fig. 14.*

Next, remove the spark plug from No. 1 cylinder and turn the engine over slowly by the starting crank, at the same time holding a finger over the spark plug hole, so that the compression stroke can be determined by the air blowing out of the hole.

The flywheel is marked with the letters ***'DC'*** near one of the air circulating vanes. This vane is further identified by an **'X'** mark cast on the end. *See Fig. 14.* When the air blows out of the No. 1 spark plug hole, continue turning the starting crank until the edge of the ***marked vane*** on flywheel is on line with the ***mark*** on the ***vertical centerline*** of the ***shroud*** as shown on *Fig. 14.* Leave flywheel in this position; At this point the ***keyway*** for mounting the flywheel is also on top.

Next, remove fitting from ***inspection hole,*** located in the gear cover at the magneto mounting flange, as shown in *Fig. 14.*

Assuming that the magneto has been removed from the engine, the following procedure should be followed before replacing magneto:

The Number 1 cylinder firing position of the magneto must be determined; Insert the ignition cable into the No. 1 tower terminal of the magneto end cap and hold the spark plug terminal at the other end, about 1/8" away from the magneto body. Turn the magneto gear in a clockwise rotation, tripping the impulse coupling, until the No. 1 terminal sparks, then hold the gear in this position. Mount the magneto to the engine, meshing the gears so that when the magneto is in place, the gear tooth marked with an **'X'** will be visible through the ***lower half*** of the ***inspection hole*** in the gear cover. *See Timing Diagram, Fig. 14.* Tighten the nut and capscrew for mounting the magneto, making sure the magneto flange gasket is in place.

The No. 1 terminal is the upper right hand tower on the magneto cap. The terminals follow the proper firing order of *1-3-4-2* in a clockwise direction viewing the cap end. The leads from the magneto should be connected to spark plugs of corresponding numbers, see *"Firing Order" paragraph.*

When the magneto is properly timed the impulse coupling will snap when the *'DC'* and *'X'* marked vane of the flywheel, lines up with the ***mark*** on the flywheel which should indicate the ***centerline*** of the No. 1 and 3 cylinders. This can be checked by turning crankshaft over slowly by hand. The impulse will also snap every 180° of flywheel rotation thereafter.

The proper spark advance is **23°**. To check timing with a ***neon light,*** the running spark advance is indicated by a 1/8" diameter hole on the flywheel shroud, 23° before ***vertical centerline*** of the No. 1 and 3 cylinders. *See Fig. 14.* The end of the *'X'* marked vane should be whitened with chalk or paint for this operation.

The magneto rotates at crankshaft speed in clockwise direction when viewing driving gear end of magneto. The magneto distributor ***rotor turns at half engine speed.***

FIRING ORDER

The ***firing order*** of the cylinder is *1-3-4-2,* and the magneto ***distributor rotor turns at one-half engine speed,*** as is the case with conventional *'in line'* engines. The intervals between the firing of the cylinders is 180°. ***No. 1*** cylinder is the one nearest to the flywheel in the left bank of cylinders, when viewed from the flywheel end of the engine. ***No. 3*** cylinder is the other cylinder in this bank. ***No. 2*** cylinder is the one nearest to the flywheel in the right bank of cylinders and ***No. 4*** is the other cylinder in this bank. The cylinders are numbered from *1* to *4* on the air shroud near the spark plugs, *see Figs. 1* and *2.* The flywheel end of the engine is designated the front end, and the power take-off end, the rear end of the engine.

SPARK PLUGS – RADIO SHIELDED

The spark plug gap should be thirty thousandths ***(.030)*** of an inch, and plugs should be kept clean both inside and out. The spark plug thread is 18 millimeter. Be sure to use a good gasket under the spark plug. Tighten spark plugs, 25 to 30 foot pounds torque. Refer to Engine Parts List section for part numbers of replacement spark plugs.

RESTORING COMPRESSION

On a new engine or on one which has been out of operation for some time, the oil may have drained off the cylinder so that compression will be weak. This may cause difficulty in starting. To remedy this condition, remove the spark plugs and pour about a fluid ounce of crankcase oil through the spark plug hole into each cylinder. Turn the engine over several times with the starting crank to distribute the oil over the cylinder walls. Then replace the spark plugs and compression should be satisfactory.

HIGH TEMPERATURE SAFETY SWITCH

As a safety precaution against overheating, some engines have a high temperature safety switch mounted on the cylinder head near the ***No. 2*** spark plug. This switch will automatically stop the engine when head temperatures rise beyond a safe degree.

The switch is set by the manufacturer to operate at a predetermined temperature, and consequently, should not be tampered with. If an unusually high cylinder head temperature causes the switch to automatically short out the magneto and stop the engine, a waiting period of about *15* minutes will be required before the switch has cooled off sufficiently to allow the engine to be re-started. An overheated engine will score the cylinder walls, burn out connecting rod and crankshaft bearings, also warp pistons and valves. The cause of the overheating condition will have to be remedied before the engine is re-started. *See* ***Engine Overheats*** *paragraph in Troubles, Causes and Remedies section.*

TROUBLES
CAUSES AND REMEDIES

Three prime requisites are essential to starting and maintaining satisfactory operation of gasoline engines. They are:

1. ***A proper fuel mixture*** in the cylinder.
2. ***Good compression*** in the cylinder.
3. ***Good spark, properly timed,*** to ignite the mixture.

If all three of these conditions do not exist, the engine cannot be started. There are other factors which will contribute to hard starting; such as, too heavy a load for the engine to turn over at a low starting speed, a long exhaust pipe with high back pressure, etc. These conditions may affect the starting, but do not necessarily mean that the engine is improperly adjusted.

As a guide to locating any difficulties which might arise the following causes are listed under the three headings: ***Fuel Mixture, Compression*** and ***Ignition.***

In each case the causes of trouble are given in the order in which they are most apt to occur. In many cases the remedy is apparent, and in such cases no further remedies are suggested.

STARTING DIFFICULTIES

FUEL MIXTURE

No fuel in tank or fuel shut-off valve closed.

Fuel pump diaphragm worn out, so pump does not supply carburetor with fuel.

Carburetor not choked sufficiently, especially if engine is cold.

Water, dirt, or gum in gasoline interfering with free flow of fuel to carburetor.

Poor grade or stale gasoline that will not vaporize sufficiently to form the proper fuel mixture.

Carburetor flooded, caused by too much choking, especially if engine is hot. Crank with choke open.

Dirt or gum holding float needle valve in carburetor open. This condition would be indicated if fuel continues to drip from carburetor with engine standing idle. Often tapping the float chamber of the carburetor very lightly with the wood handle of a screw driver or similar instrument will remedy this trouble. Do not strike carburetor with any metal tools, it may cause serious damage. Also if the mixture in the cylinder, due to flooding, is too rich, starting may be accomplished by continued cranking with the carburetor choke open.

If, due to flooding, too much fuel should have entered the cylinder in attempting to start the engine, the mixture will most likely be too rich to burn. In that case the spark plugs should be removed from the cylinders and the engine then turned over several times with the starting crank, so the rich mixture will be blown out through the spark plug holes. The choke on the carburetor should of course be left open during this procedure. The plugs should be dried off, reassembled, and starting tried again.

To test for clogged fuel line, loosen fuel line nut at carburetor slightly. If line is open, fuel should drip out at loosened nut.

COMPRESSION

If the engine has proper compression, considerable resistance will be encountered in the pull on the starting crank. If this resistance is not encountered, compression is faulty. Following are some reasons for poor compression:

Cylinder dry due to engine having been out of use for some time. *See 'Restoring Compression', Page 14.*

Loose spark plugs or broken spark plug. In this case, a hissing noise will be heard in cranking engine, due to escaping gas mixture on compression stroke.

Damaged cylinder head gasket or loose cylinder head. This will likewise cause hissing noise on compression stroke.

Valve stuck open due to carbon or gum on valve stem. To clean valve stems, *see 'Valves', Page 20.*

Valve tappets adjusted with insufficient clearance under valve stems. *See 'Valve Tappets', Page 21.*

Piston rings stuck in piston due to carbon accumulation. If rings are stuck very tight this will necessitate removing piston and connecting rod assembly and cleaning parts. *See 'Piston and Connecting Rod', Page 19.*

Scored cylinders. This will require reboring of the cylinders and fitting with new pistons and rings. If scored too severely, an entirely new cylinder block may be necessary.

IGNITION

See 'Magneto Ignition Spark', No spark may also be attributed to the following:

Ignition cable disconnected from magneto or spark plugs.

Broken ignition cables, causing short circuits.

Ignition cables wet or oil soaked.

Spark plugs wet or dirty.

Spark plug point gap wrong.

Condensation on spark plug electrodes.

Magneto breaker points pitted or fused.

Magneto breaker arm sticking.

Magneto condenser leaking or grounded.

Spark timing wrong.

ENGINE MISSES

Spark plug gap incorrect.

Worn and leaking ignition cables.

Weak spark.

Loose connections at ignition cable.

Magneto breaker points pitted or worn.

Water in gasoline.

Poor compression.

ENGINE SURGES OR GALLOPS

Carburetor flooding.

Governor spring hooked into wrong hole in lever, or governor rod incorrectly adjusted.

ENGINE STOPS

Fuel tank empty.

Water, dirt or gum in gasoline.

Gasoline vaporized in fuel lines due to excessive heat around engine (Vapor Lock).

Vapor lock in fuel lines or carburetor due to using winter gas (too volatile) in hot weather.

Air vent hole in fuel tank cap plugged. Engine scored or stuck due to lack of oil.

Ignition troubles.

ENGINE OVERHEATS

Crankcase oil supply low. Replenish immediately.

Ignition spark timed wrong.

Low grade of gasoline.

Engine overloaded.

Restricted cooling air circulation.

Part of air shroud removed from engine.

Dirt between cooling fins on cylinder or head.

Engine operated in confined space where cooling air is continually recirculated, consequently becoming too hot.

Carbon in engine.

Dirty or incorrect grade of crankcase oil.

Restricted exhaust.

Engine operated while detonating due to low octane gasoline or heavy load at low speed.

ENGINE KNOCKS

Poor grade of gasoline or of low octane rating.

Engine operating under heavy load at low speed.

Carbon or lead deposits in cylinder head.

Spark advanced too far.

Loose or burnt out connecting rod bearing.

Engine overheated due to causes under previous heading.

Worn or loose piston pin

ENGINE BACKFIRES THROUGH CARBURETOR

Water or dirt in gasoline.

Engine cold.

Poor grade of gasoline.

Sticky inlet valves.

Overheated valves.

Spark plugs too hot.

Hot carbon particles in engine.

DISASSEMBLY AND REASSEMBLY OF MVG4D ENGINE

Engine repairs should be made only by a mechanic who has had experience in such work. When disassembling the engine it is advisable to have several boxes available so that parts belonging to certain groups can be kept together, such as, for instance, the cylinder head screws, etc. Capscrews of various lengths are used in the engine, therefore great care must be exercised in reassembly so the right screw will be used in the proper places.

Tighten the cap screws and nuts of the manifolds, cylinder heads, gear cover, oil pan, connecting rods, cylinder blocks, main bearing plate and the spark plugs to the specified torque readings indicated in the following paragraphs of reassembly.

While the engine is partly or fully dismantled, all of the parts should be thoroughly cleaned. Remove all accumulated dirt between the fins.

If it is desired to disassemble the engine, the following order should be substantially adhered to. As disassembly progresses, the order may be altered somewhat if desired, as will be self-evident to the mechanic. Reassembly of the engine should be made in the reverse order.

TESTING REBUILT ENGINE

An engine that has been completely overhauled, such as having the cylinders rebored and fitted with new pistons, rings and valves, should go through a thorough "run-in" period, before any amount of load is applied to the engine.

The engine should be started and allowed to run for about one-half hour, at about 1200 to 1400 R.P.M. without load. The R.P.M. should then be increased to engine operating speed, still without load, for an additional three and one-half to four hours.

The proper "running-in" of the engine will help to establish polished bearing surfaces and proper clearances between the various operating parts and thus add years of trouble free service to the life of the engine.

ACCESSORIES

The air cleaner, oil filter, magneto, and if an electric starter and generator are used, these should be removed first. Clean and repair before reassembly.

Remove clutch or clutch reduction unit if engine is equipped with either of these accessories.

SHEET METAL HOUSE

On power units; engine which are enclosed in a sheet metal house, remove the muffler and canopy first. Disconnect air cleaner, choke, governor control and instrument wires at the front house panel. The front panel can be removed as part of the flywheel shroud, as explained in the following paragraphs of disassembly.

FLYWHEEL

After the flywheel screen has been removed, the flywheel nut and the generator drive pulley should be taken off. Then as shown in *Fig. 15*, the flywheel can be removed from the crankshaft.

Take a firm hold on the flywheel fins, pull outward and at the same time strike the end of the crankshaft with an aluminum hammer. *See Fig. 15.* The flywheel will slide off the taper of the crankshaft. Do not use a hardhammer as it may ruin the crankshaft and bearings. When reassembling the flywheel, be sure the Woodruff key is in position on the shaft and that the keyway in the flywheel is lined up accurately with the key.

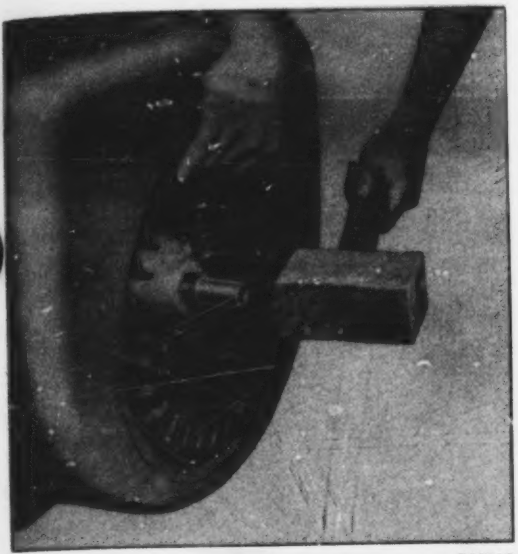


Fig. 15 76696C

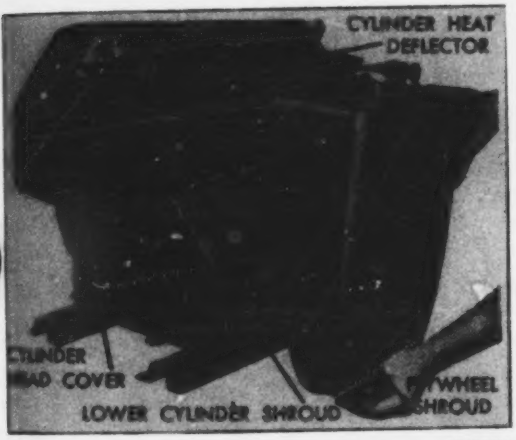

CYLINDER HEAT DEFLECTOR
CYLINDER
EAD COVER
LOWER CYLINDER SHROUD
WHEEL
SHROUD

Fig. 16 104811C

AIR SHROUDING

To disassemble air shrouding, refer to *Fig. 16.* First remove cylinderhead covers and the screws mounting the flywheel shroud to the lower cylinder shrouds and cylinderheat deflectors; then remove the screws holding the flywheel shroud to gear cover.

On power units, remove the front end panel as shown in *Fig. 17*, together with flywheel shroud. Disassemble rear end panel, as shown in *Fig. 18*, complete with fuel tank. Balance of shrouding can now be readily removed.

FUEL TANK

If a side mount gasoline tank is used, this should be removed next. *See Fig. 19.*

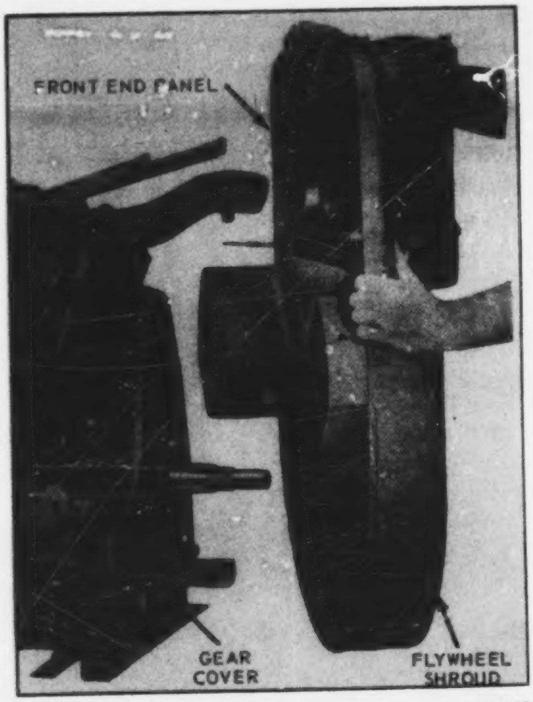

FRONT END PANEL
GEAR COVER
FLYWHEEL SHROUD

Fig. 17 180184C

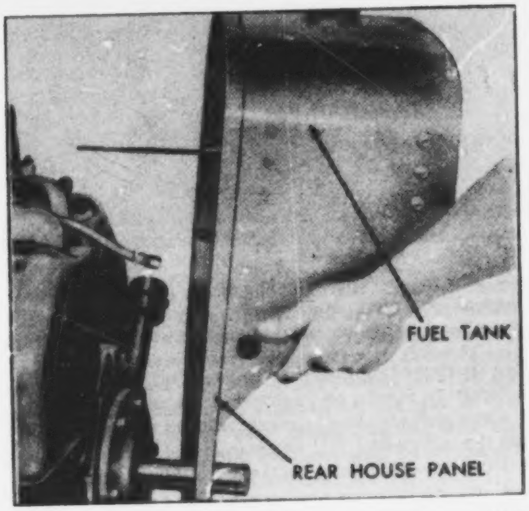

FUEL TANK
REAR HOUSE PANEL

Fig. 18 71050C

CARBURETOR AND MANIFOLDS

The carburetor and manifold can be removed as a complete unit as shown in *Fig. 20.*

In reassembly, tighten the nuts for mounting the manifolds, 40 to 50 foot pounds torque. Tightening beyond specification may cause the flanges to break.

CYLINDER HEAD

The cylinder head must be removed if it is necessary to regrind valves, or to do work on the piston,rings or connecting rod. All of the cylinder head screws are plainly in view and can be easily removed. Screws

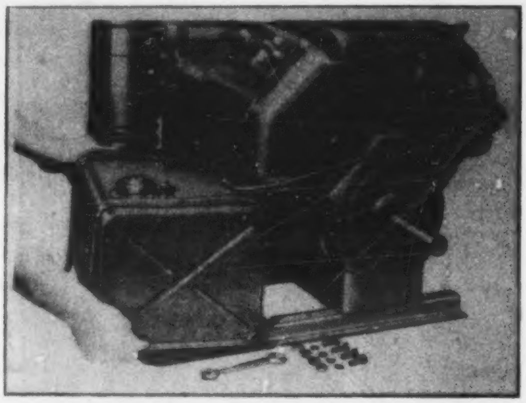


Fig. 19 83608C

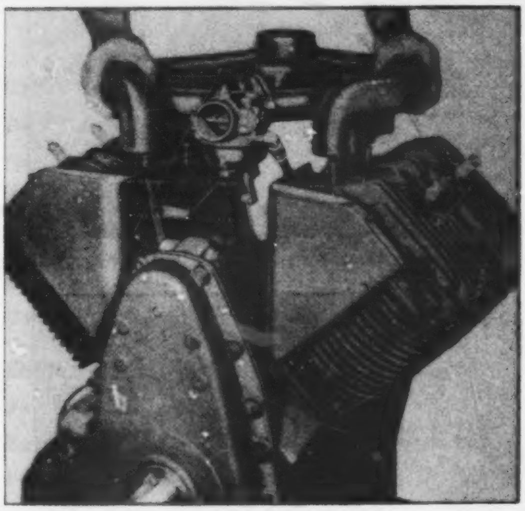


Fig. 20 104579C

of different lengths are used but these can be properly reassembled according to the various lengths of cylinder head bosses.

Before reassembling the cylinder head, all carbon and lead deposits should be removed. It is recommended that a new cylinder head gasket be used on reassembly as the old gasket will be compressed and hard so that it may not seal properly. Use a mixture of graphite and oil on the cylinder head screws, to prevent them from rusting tight against the cylinder block. Tighten cylinder head screws, 25 to 32 foot pounds torque, and after complete assembly and engine is run in, retorque head screws.

GEAR COVER

Disconnect the governor linkage and remove the governor assembly. Remove gear cover screws and drive out the two dowel pins as shown in *Fig. 21.* The gear cover can then be taken off, exposing the timing gears as shown in *Fig. 22.* In reassembly, tighten gear cover capscrews, 14 to 18 foot pounds torque.

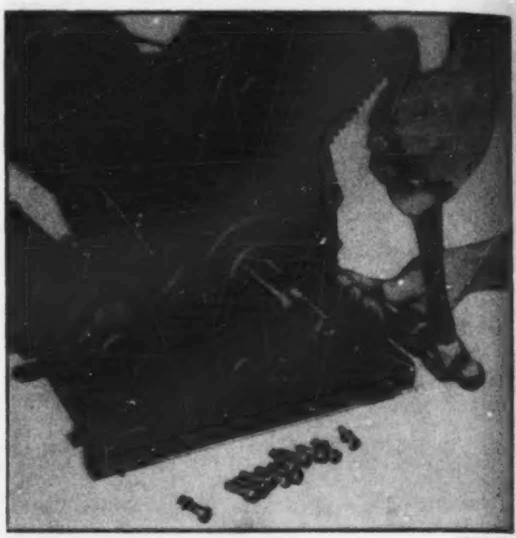


Fig. 21 71056C

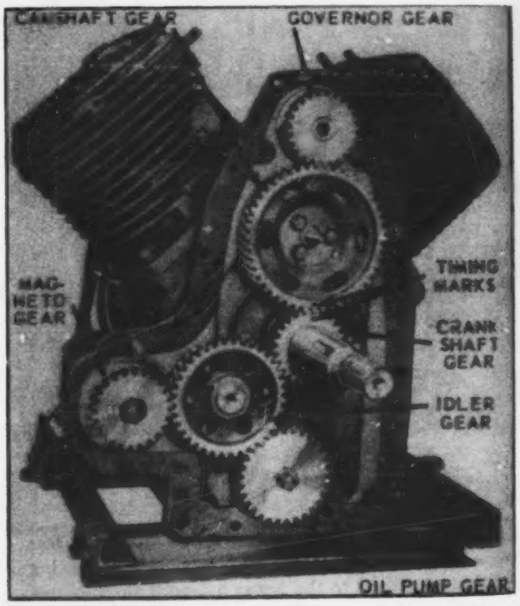


Fig. 22 104716C-1

GEAR TRAIN

With the removal of gear cover and oil sling, the gear train will be exposed as shown in *Fig. 22.* Remove camshaft thrust plunger and spring, to prevent their being lost.

Future reference can be made to *Fig. 22* when assembling crankshaft and camshaft, as accurate location of the timing marks is essential.

IDLER GEAR AND SHAFT

Remove the Allen-head set screw, on the magneto side of the crankcase, which locks the idler shaft in position. With the use of a gear puller, the idler

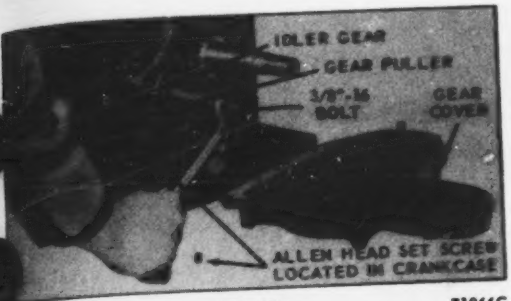


Fig. 23 71066C

Fig. 24 104721C

shaft and idler gear assembly can be removed from the crankcase. *See Fig. 23.*

In reassembly; be sure oil groove in shaft is facing up. Drive shaft into crankcase with soft metal hammer and maintain a *.003* to *.004 inch* clearance between idler gear and shoulder of shaft.

OIL PAN

The engine can now be inverted so that the supports and oil pan can be removed. *See Fig. 24.*

In reassembly, mount deep end of oil pan toward oil pump. Tighten mounting screws, 6 to 9 foot pounds torque.

OIL PUMP

To remove oil pump, first take out the slotted pipe plug, and then with a 5/32 inch Allen wrench, remove the oil pump lockscrew, as shown in *Fig. 25.* Remove locknut holding oil pump driving gear to shaft. Then, with a soft brass rod or punch, drive shaft through gear as shown in *Fig. 26.* The oil pump can then be withdrawn toward center of crankcase.

PISTONS AND CONNECTING RODS

After removal of the oil pump, all of the connecting rod bolts will be accessible. Remove the palnuts and hexagon nuts, then by tapping the ends of the bolts lightly, being careful not to mar the threads, the connecting rod cap can be freed from the bolts. The rod with the piston can now be pushed up through the cylinder. Be careful not to score the crankshaft journals, by allowing the rod bolts to strike or scrape across them, when removing the connecting rod and piston assemblies. Replace the caps on the rods immediately so that they are in the correct position for reassembly. A number is stamped on the side of the rod and cap to match each connecting rod with its corresponding cap. These numbers must be on identical sides of the rod in reassembly. *See Fig. 27.*

Fig. 25 180178C

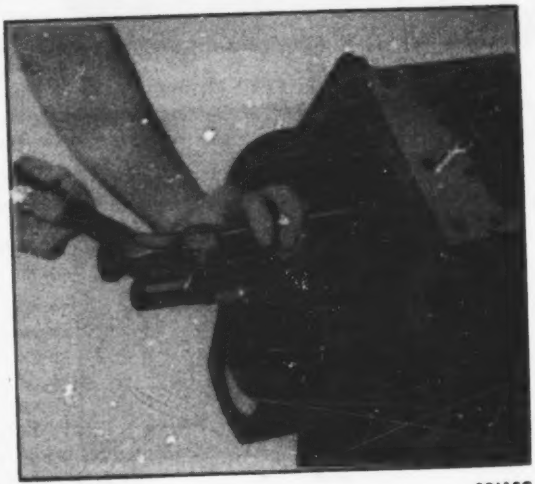


Fig. 26 83615C

The connecting rods have removable shell bearings and care should be taken in reassembly that they are in place in the rod and cap. When replacing the shell bearings, be sure and replace a complete bearing (2 halves).

The piston skirt is *cam-ground* to an elliptical contour. Clearance between the piston and cylinder must be measured at the center of the thrust face of the piston skirt. Refer to Chart, *Fig. 30*, for proper clearance. The thrust faces on the piston skirt are 90° from the axis of the piston pin hole. *See Fig. 28.*

When reassembling the piston and connecting rod to

Fig. 27

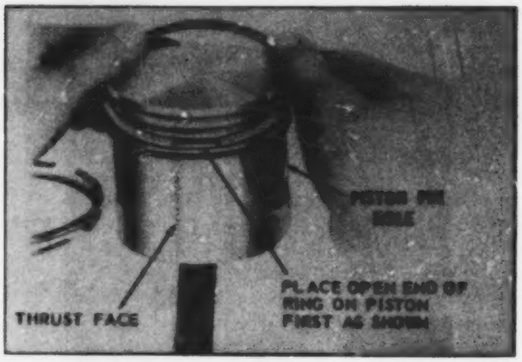


Fig. 28 71152C

the engine, be sure the *arrow* on the top of the piston is pointing in the direction of crankshaft rotation. (Clockwise when viewing the flywheel end of the engine). *See Engine Sectional, Fig. 3.*

Tighten connecting rod nuts, 28 to 32 foot pounds torque, then install 'Pal' locknuts and tighten with wrench 1/4 turn beyond 'finger-tight' position.

Be sure piston and connecting rod assemblies are put back into the same bore from which they were removed.

PISTON RINGS

Install rings by placing the open end of the ring on piston first, as shown in *Fig. 28.* Spread ring only far enough to slip over piston and into correct groove, being careful not to distort ring.

The Number 2 compression ring must be installed on the piston with the scraper edge down, otherwise oil pumping and excessive oil consumption will result. *See Fig. 29.*

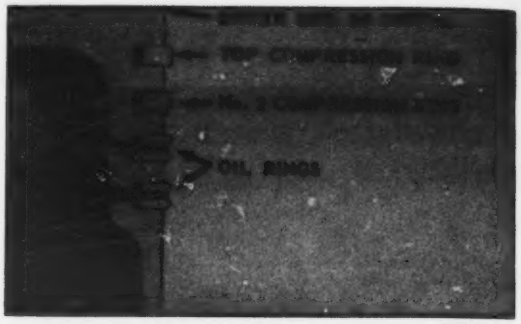


Fig. 29 209574C

Use a suitable ring compressor in reassembly and stagger the piston ring gaps 90° apart around the piston. Oil the pistons, rings, wrist pin, rod bearings and cylinder walls before assembly.

CYLINDERS

The cylinder blocks can now be removed from the crankcase if necessary. In reassembling, put the blocks back on the same side from which they were removed. Clean all dirt and other deposits from fins before reassembling. If the cylinders are worn more than .005 inch oversize, they should be reground and fitted with oversize pistons and rings.

Tighten cylinder block mounting nuts, 62 to 78 foot pounds torque.

VALVES

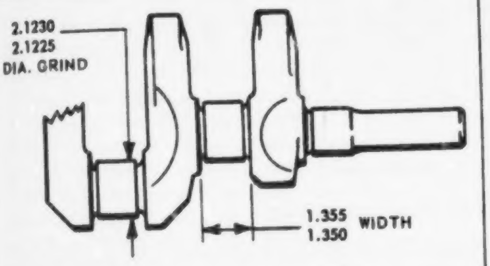
Remove the valve tappet inspection plate and compress the valve springs with a standard automotive type valve lifter, as shown in *Fig. 31.* If cylinder block is still attached to the engine, insert a rag in the opening at the bottom of the valve chamber so the roto-cap and valve spring seat retaining locks do not fall into the crankcase. Remove the roto-caps, valve spring seat retaining locks, seats, springs, valves and clean these, as well as the ports and guides, of all carbon and gum deposits. Tag each valve so that in reassembly they will be mounted in the same guide they were removed from.

Non-positive type roto-caps are provided on the ends of the valve stems. In reassembly, be sure to assemble the roto-caps to the end of the valve stems.

The valve face is ground at 45° to the vertical center line of the valve stem and the valve seat insert should also be ground at a 45° angle. After grinding, valves and inserts should be lapped with a suitable lapping compound or they will leak due to improper seating within the first few hours of operation. After valve seats have been cleaned, apply lapping compound to the valve face and put the valves back into their guides. Lap the valves by rotating them back and forth with a reciprocating advancing valve tool. Occasionall ·lift the valves and reseat them in a different position to insure a uniform seat which will show entirely around the valves. After valves have been lapped in evenly, remove them from the block and wash the valves and block thoroughly with gasoline or kerosene.

PISTON, RING AND ROD CLEARANCES CHART

PISTON TO CYLINDER AT PISTON SKIRT THRUST FACES		.0052 to .0062"
PISTON RING COMPRESSED GAP		.025 to .035"
PISTON RING SIDE CLEARANCE IN GROOVES	Top Ring	.002 to .004"
	2nd Ring	.0015 to .0035"
	3rd, 4th Groove Oil Rings	.001 to .003"
CONNECTING ROD TO CRANK PIN – SIDE CLEARANCE		.008 to .015"
CONNECTING ROD SHELL BEARING TO CRANK PIN		.0015 to .003"
PISTON PIN – TO PISTON TO CONNECTING ROD BUSHING		.0000 to .0003" .0002 to .0007"



STANDARD CRANK PIN DIMENSIONS

Fig. 30

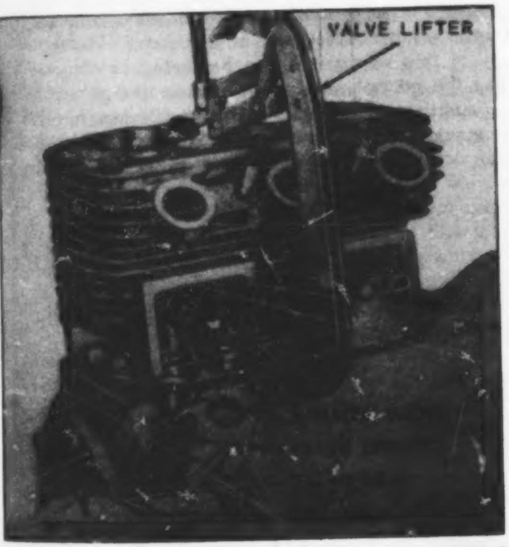


Fig. 31 189221C

The cylinder blocks have replaceable valve guides. The valve stems have a clearance of .0025" to .0045" in the guides. When the clearance becomes .008", the guides should be driven out and replaced with new guides.

The valves and valve seat inserts are of 'Stellite' material.

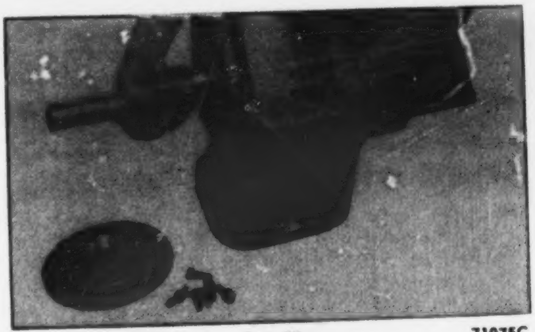


Fig. 32 71075C

CRANKSHAFT

To remove the crankshaft, first remove the six capscrews in the main bearing plate at the take-off end of the engine. The plate can then be pried off and the crankshaft removed from that end of crankcase. *See Fig. 32.* Be sure to keep shims and gaskets in place as these are necessary to give the proper end play to the tapered roller bearings on the crankshaft. This end play should be *.002* to *.004* inch when engine is cold. There is practically no wear in these bearings so that no readjustment is necessary after proper assembly.

When reassembling crankshaft, the timing marks on the crankshaft gear and camshaft gear must match up, *see Fig. 22*, otherwise engine will not operate properly, or if timing is off considerably, engine will not run at all.

Mount main bearing plate in the correct position in reassembly. The word *'TOP'* is cast on the outside of the plate, and should be mounted in this position. Mounting the main bearing plate upside down would prevent the main bearing from being properly lubricated. Tighten main bearing plate capscrews, 25 to 30 foot pounds torque.

CAMSHAFT

Remove all valve tappets and withdraw camshaft from crankcase. *See Fig. 33.* When replacing, be sure the spring and plunger are in place in the end of the camshaft, as these hold the camshaft in position endwise.

Camshaft gear is removed by taking out the three screws and lockwashers, and then prying the gear off the end of the camshaft. The camgear has offset mounting holes to provide accurate assembly for valve timing. The gear can only be put on the correct way for matching up the timing mark with that of the crankshaft. *See Gear Train, Fig. 22.*

VALVE TAPPETS – ADJUSTMENT

The valve tappets must be pulled out before the camshaft is removed. In reassembly, the tappets can be inserted in proper position in the crankcase after the camshaft is reassembled. *See Fig. 33.*

After the cylinder block assemblies have been mounted to the crankcase, the tappets should be adjusted.

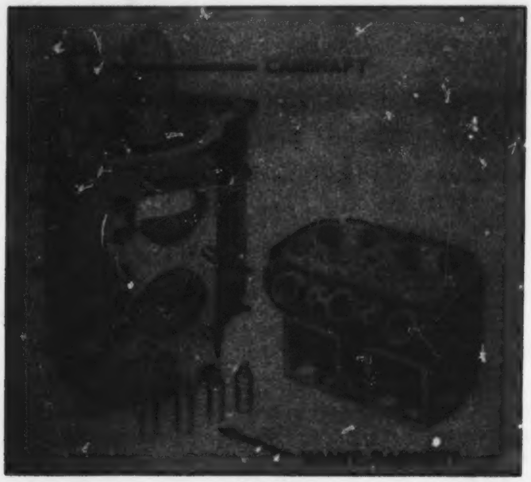


Fig. 33 104569C

Fig. 34 180186C

See Fig. 34. With the tappets in their lowest positions, engine cold, the clearance should be:

Inlet Valves .008", Exhaust Valves .016"

GOVERNOR – OPERATION

The centrifugal flyball governor rotates on ball-bearing supported shaft in the upper part of the timing gear cover, and the governor is driven off the camshaft gear at 1-1/8 times crankshaft speed.

The flyweights are hinged to lugs on a drive hub behind the gear. Hardened pins on the flyweights bear against the flanged sliding sleeve, moving it back and forth as the flyweights move in or out. The motion of the sleeve is transmitted through a ball thrust bearing to the governor lever, which in turn is connected to the carburetor throttle lever. A spring connected to the governor lever tends to hold the governor flyweights to their *inner* position, also to hold the carburetor throttle open. As the engine speed increases, the centrifugal force in the flyweights acts against the spring and closes the throttle to a point where the engine speed will be maintained practically constant under varying load conditions. This speed can be varied to suit conditions by adjusting the governor spring tension to suit.

FULL LOAD R.P.M.	NO LOAD R.P.M.	HOLE NO.
1400	1550	4
1500	1650	5
1600	1725	5
1700	1850	6
1800	1950	7
1900	2050	8
2000	2125	8
2100	2250	9
2200	2350	10
2300	2425	10
2400	2550	11

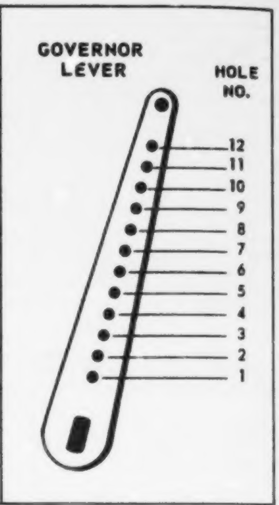


Fig. 35

GOVERNOR ADJUSTMENT

The control rod between the governor and carburetor must be adjusted to the proper length, otherwise governor action will be faulty. With the engine at rest the governor spring will hold the flyweights *in,* and the control rod must be of such length as to hold the carburetor throttle wide open at that point. The accuracy of this adjustment can be tested by disconnecting the control rod ball joint from the governor lever, and then pushing the rod assembly toward the carburetor as far as it will go. This will open the throttle wide. The governor lever should then be moved as far as possible in the same direction. Holding both parts in the above position, the ball joint should be screwed on to the control rod until the right angle stud on the ball joint fitting will register with the hole in the lever, then, screw fitting in two more turns. Insert ball joint stud into the hole in the governor lever, assemble and tighten locknuts. With the governor lever pushed toward the carburetor as far as it will go, there should be about a 1/16 inch clearance between the throttle lever and the stop pin on the carburetor. The clearance will cause the lever to bounce back from the stop pin, rather than jam against the pin, when a load is suddenly applied to an idling engine. This will eliminate excessive wear on the threads of the control rod and ball joints.

The governor can be disassembled from the engine by first removing the governor housing, after which the entire governor can be withdrawn from the gear cover. The construction of the governor can be best seen from the sectional drawing of the engine, *Fig. 3.*

The governor lever is furnished with 12 holes for attaching the governor spring as shown in *Fig. 35.* It is very important that the spring is hooked into the proper hole to suit the speed at which the engine is operated. The Governor Lever Chart, *Fig. 35,* shows the *full load* and *no load* speeds of the engine and the hole corresponding thereto. The full load speed will be from 150 to 125 revolutions less than the no load speed. As an example, if the engine is to be operated at 2000 revolutions per minute under load, the spring should be hooked into the 8th hole in the governor lever and the spring tension adjusted by means of the adjusting screw connected to the spring, to run 2125 revolutions per minute, without load. The speed at full load will then be approximately 2000 revolutions per minute. A tachometer or revolution counter should be used against the crankshaft while adjusting the governor spring tension to give the proper engine speed.

CLUTCH AND REDUCTION UNITS

CLUTCH POWER TAKE-OFF

The clutch furnished with this model of engine is of the dry disc type. No oil should be put into the clutch housing. There are three points on these clutches requiring lubrication and these are filled with grease at the factory, *see Fig. 36*. ***Grease gun fittings*** are furnished for periodic lubrication. The ***housing bearing*** and ***pilot bearing*** should receive additional grease every fifty hours of operation. The clutch ***throwout bearing*** should be greased every day before starting. Use Mobil Gargoyle grease BRB No. 3, Sinclair AF-1 grease, or equal.

CLUTCH ADJUSTMENT

If the clutch begins to slip, it should be readjusted, otherwise it would become overheated and damaged. First release clutch operating lever and remove clutch inspection plate. For the ***Rockford clutch,*** turn clutch over until ***adjusting ring lock*** is up. Release lock with a screw driver or similar tool as shown in *Fig. 37*. The adjusting ring should then be turned in a clockwise direction one notch at a time until a very firm pressure is required to engage the clutch by the operating lever. Take-off shaft must be kept from turning when making this adjustment. Be sure to re-engage the adjusting ring lock into a notch in the ring. Replace inspection cover.

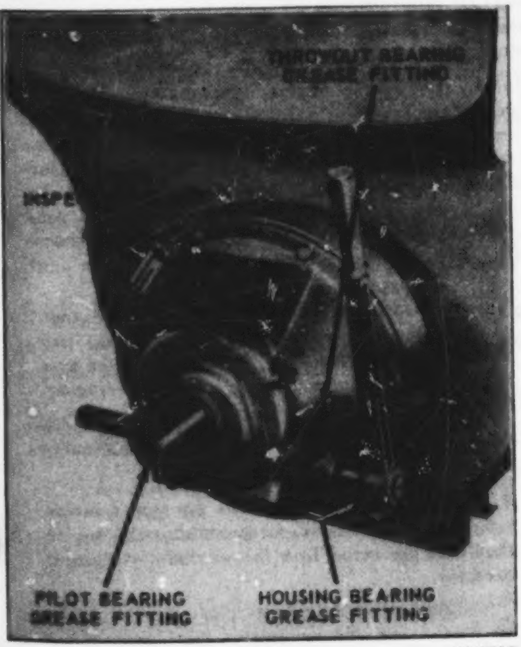

THROWOUT BEARING
GREASE FITTING
INSPE
PILOT BEARING
GREASE FITTING
HOUSING BEARING
GREASE FITTING

Fig. 36 104570C

For the ***Twin Disc clutch,*** pull adjusting lockpin out, as shown in *Fig. 38*, and turn the adjusting yoke in a clockwise direction until the operating lever requires a distinct pressure to engage.

CLUTCH REDUCTION GEARS

Clutch reduction gears are furnished with several different ratios, some with spur gears, for counter-enginewise rotation, others with internal gears, for enginewise rotation. The clutch is of the dry disc type and ***no oil should be put into the clutch housing.***

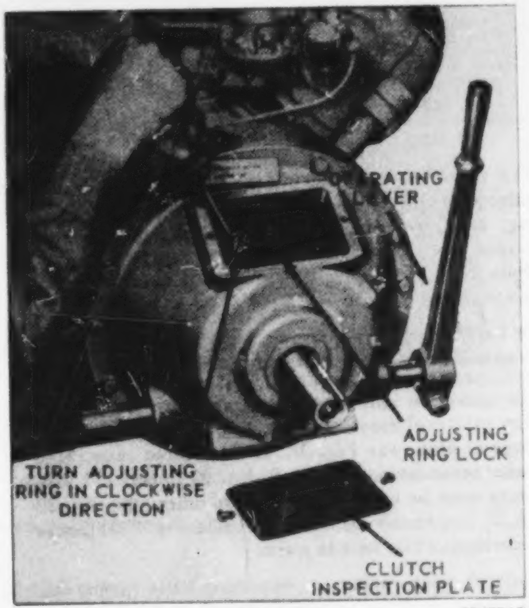

OPERATING
LEVER
ADJUSTING
RING LOCK
TURN ADJUSTING
RING IN CLOCKWISE
DIRECTION
CLUTCH
INSPECTION PLATE

Fig. 37 104574C

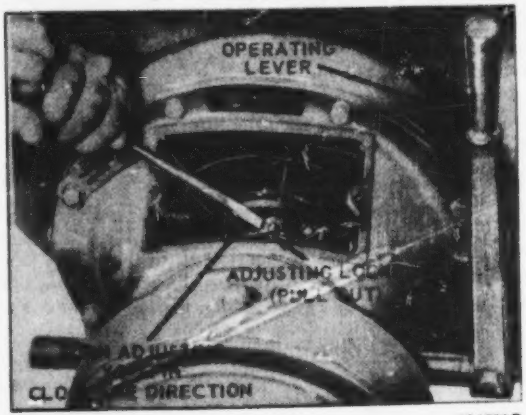

OPERATING
LEVER
ADJUSTING LOCK
(PULL OUT)
ADJUST
CLO DIRECTION

Fig. 38 104578C

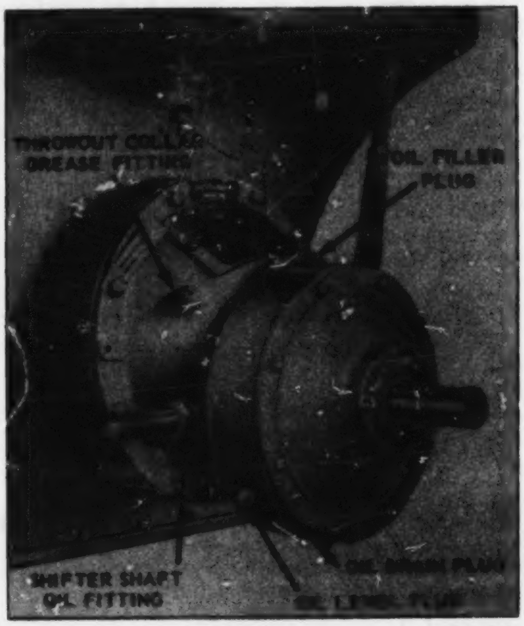


Fig. 39 104576C

The *throwout collar* should be lubricated once a day before starting. Add grease to fitting on side of housing, as illustrated in *Fig. 39*, using the same type grease as used in the clutch power take-off units. Twin Disc units have an external grease fitting for the throwout bearing.

The shifter shaft should be lubricated periodically, if external oil fittings are provided for this purpose.

The reduction unit is operated in oil and the gear case oil level must be maintained to the oil ***saber gauge*** or ***plug***, *see Fig. 39*. In ***Twin Disc*** units, high grade transmission oil S.A.E. No. 90 to No. 110 Viscosity must be used. For ***Rockford*** units, use No. 30 S.A.E. crankcase oil. Change oil every 2000 hours of service, while unit is warm.

If clutch slips, heats, or operating lever jumps out, the clutch must be adjusted. Release clutch operating lever and remove hand hole plate. The ***clutch*** in the clutch reduction units is the same as is used in the clutch power take-off units. Refer to "Clutch Adjustment" paragraph for adjustment of the clutch in the ***Twin Disc*** and ***Rockford*** clutch reduction units. A new clutch generally requires several adjustments until the friction surfaces are worn in.

INSTRUCTIONS FOR PROTECTING ENGINE DURING PERIODS OF STORAGE

When the work interval is completed, the following instructions should be carried out very carefully to protect the engine during the storage period.

The outside of the engine, including the cooling fins on the cylinders and heads, should be thoroughly cleaned of all dirt and other deposits.

The air cleaner should be cleaned of all oil and accumulated dust, and the sediment removed from the oil cup at the bottom of the cleaner.

To protect the cylinders, pistons, rings and valves and keep them from rusting and sticking, a rust preventative oil, as specified under Military Specification MIL-0-6082, (Type 1, ready mixed, or equivalent) should be injected into the pipe tap opening on the intake manifold while the engine is warm and running at moderate speed. About a quarter of a pint is necessary on a four cylinder engine, or enough so that a heavy bluish smoke will appear at the exhaust. The ignition switch should then be shut off and the engine stopped. This operation will leave a coating of oil on the above mentioned parts, protecting them from the atmosphere.

On engines where the pipe tap opening on the intake manifold is inaccessible, the rust preventative may be injected into the air intake on the carburetor while the engine is running. The air cleaner connection will of course have to be disconnected from the carburetor to do this.

Remove plug from crankcase bottom cover and drain oil. Drain while engine is warm, as the oil will then flow much more freely than when cold.

Drain fuel system, including gasoline lines, carburetor, fuel pump and tank of all gasoline, to prevent lead and gum deposits from forming.

All exposed unpainted metal parts should be coated with grease or heavy oil.

The air cleaner or carburetor intake, as well as the exhaust manifold and breather openings, should be taped or otherwise sealed off for the duration of the storage period.

Before starting the engine after the storage period, remove crankcase drain plug so that any condensation which may have collected may be drained before new crankcase oil is added. It is highly recommended that the crankcase bottom cover be removed before starting the engine, and scrubbing off all sediment which may have collected there. When reassembling the bottom cover a new gasket should be used.

> ***Be sure to fill crankcase with the correct grade of oil to the full mark on the saber. Do not use any oil heavier than SAE No. 30. Also be sure to put oil to the proper level in the air cleaner.*** *(Refer to Lubrication and Air Cleaner.)*

Refuel engine and follow the starting instructions as shown on preceding pages of this manual.

> ***It is suggested that machines be stored inside a building. If this is not possible, the engine should be protected from the weather by a proper covering.***

REPAIR PARTS LIST

READ THESE INSTRUCTIONS BEFORE ORDERING PARTS

THE MODEL, SPEC AND SERIAL NUMBER OF YOUR ENGINE, SHOWN ON THE NAME PLATE ATTACHED TO THE AIR SHROUD, MUST BE GIVEN WHEN ORDERING PARTS.

FILL IN THE ABOVE INFORMATION ON THE PHOTO OF THE NAME AND INSTRUCTION PLATE SO THAT IT WILL BE AVAILABLE TO YOU WHEN ORDERING PARTS.

WISCONSIN
ENGINE

276192C

TO INSURE PROMPT AND ACCURATE SERVICE, THE FOLLOWING INFORMATION MUST ALSO BE GIVEN.

1. State exactly, quantity of each part and part number.
2. State definitely, whether parts are to be shipped by express, freight or parcel post.

SERVICE FACILITIES

Approved engine service stations, located throughout the U.S. and foreign countries, have been carefully selected by the WISCONSIN MOTOR CORPORATION in order to assure complete and efficient repair and inspection service to owners of Wisconsin Air Cooled Engines. These service stations, equipped and trained for complete engine repair, also stock parts to facilitate immediate delivery for all Wisconsin Air Cooled Engines.

A DIRECTORY OF SERVICE STATIONS CAN BE FOUND IN THE BACK OF THIS MANUAL.

PARTS RETURNED FOR CREDIT

Before returning any parts, write a letter to the company from whom the parts were purchased, giving an exact list and description of the materials, why you wish to return them, whether for repairs, credit, or replacement, and also the MODEL, SPECIFICATION and SERIAL numbers of the engine from which the parts were taken. If authority is granted for their return, transportation charges must be prepaid and sender's name marked on the outside of the box or package.

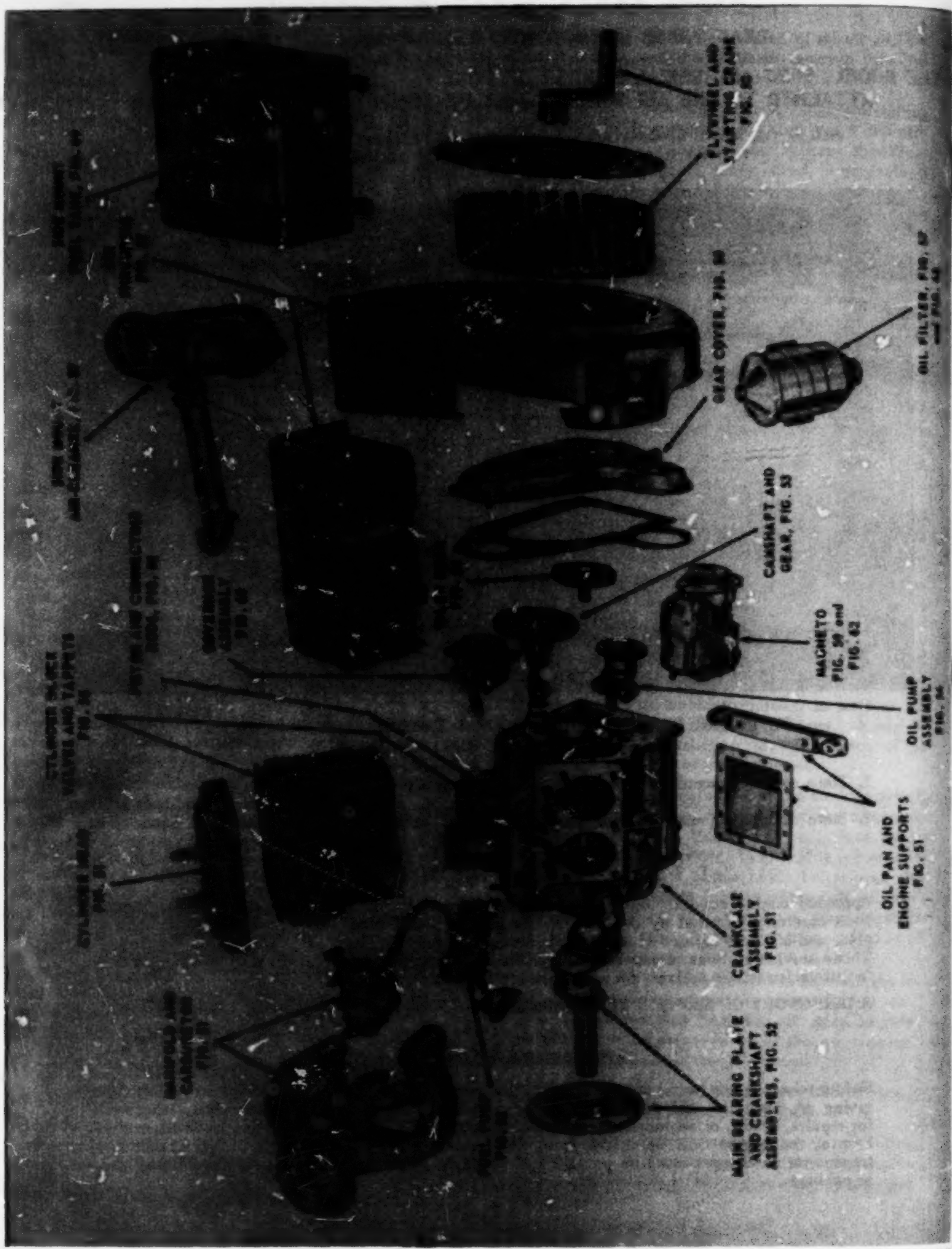

FLYWHEEL AND STARTING CRANK FIG. 50
GEAR COVER, FIG. 56
OIL FILTER, FIG. 57 and FIG. 62
CAMSHAFT AND GEAR, FIG. 53
MAGNETO FIG. 59 and FIG. 62
OIL PUMP ASSEMBLY FIG. 54
OIL PAN AND ENGINE SUPPORTS FIG. 51
CRANKCASE ASSEMBLY FIG. 51
MAIN BEARING PLATE AND CRANKSHAFT ASSEMBLIES, FIG. 52
CYLINDER BLOCK, VALVES AND TAPPETS
PISTON AND CONNECTING ROD
CYLINDER HEAD
2383

Fig. 50, EXPLODED VIEW OF ENGINE

Refer to figure numbers for break down of parts.

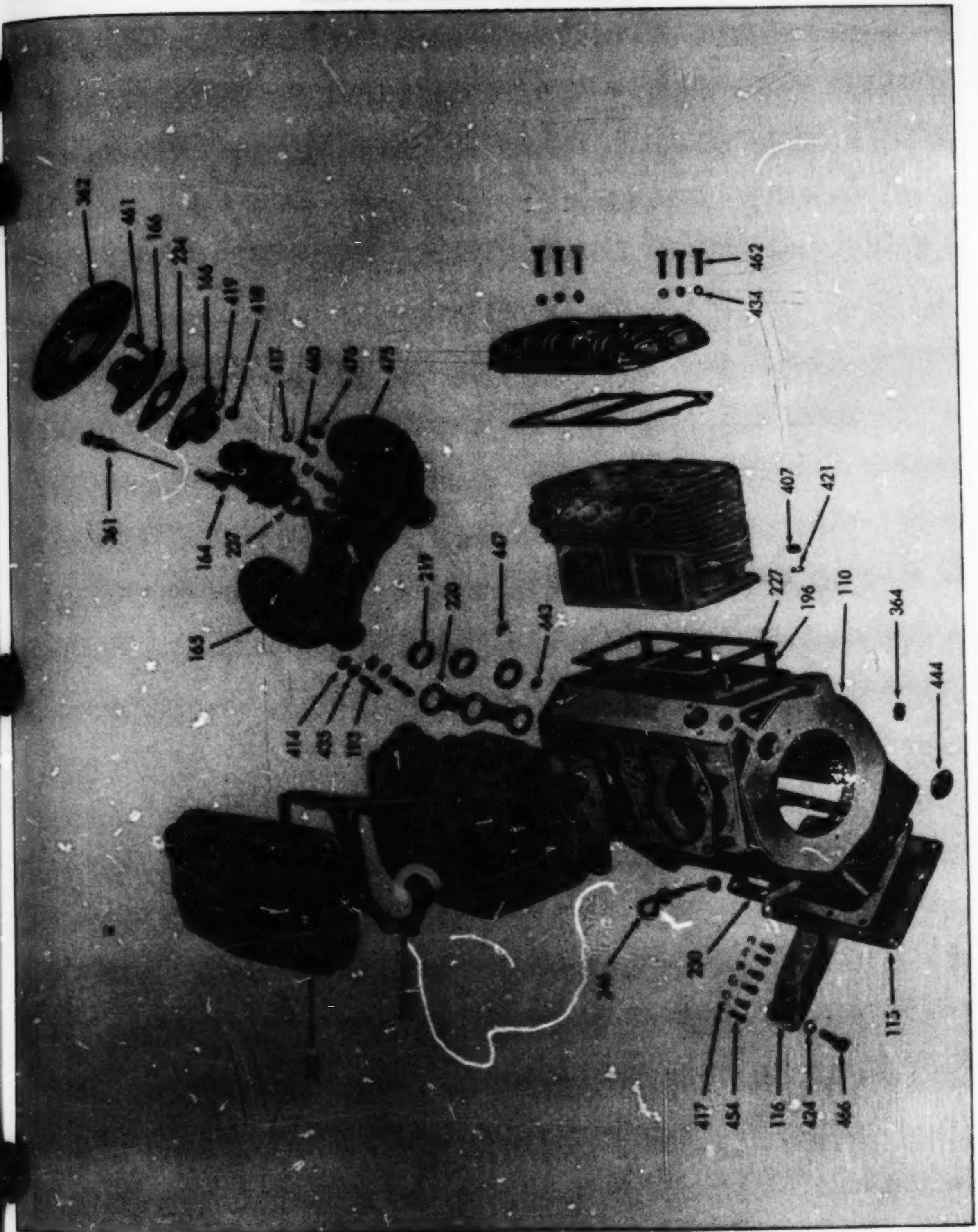
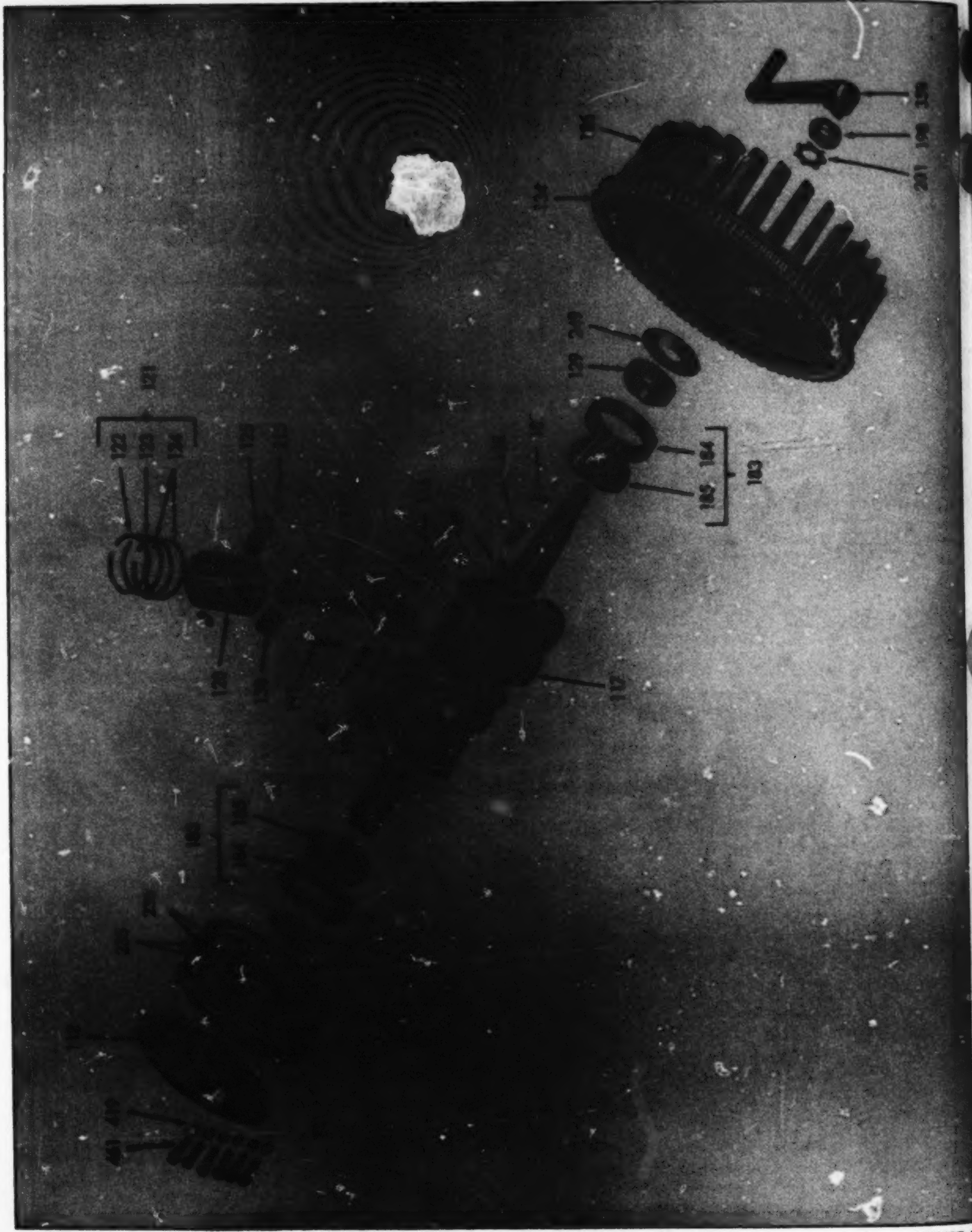

362
441
166
234
166
419
418
417
460
476
475
361
164
237
165
219
220
447
443
414
433
193
462
434
407
421
227
196
110
364
444
246
200
115
417
454
116
424
466
238249C

Fig. 51, MANIFOLD AND CRANKCASE GROUP

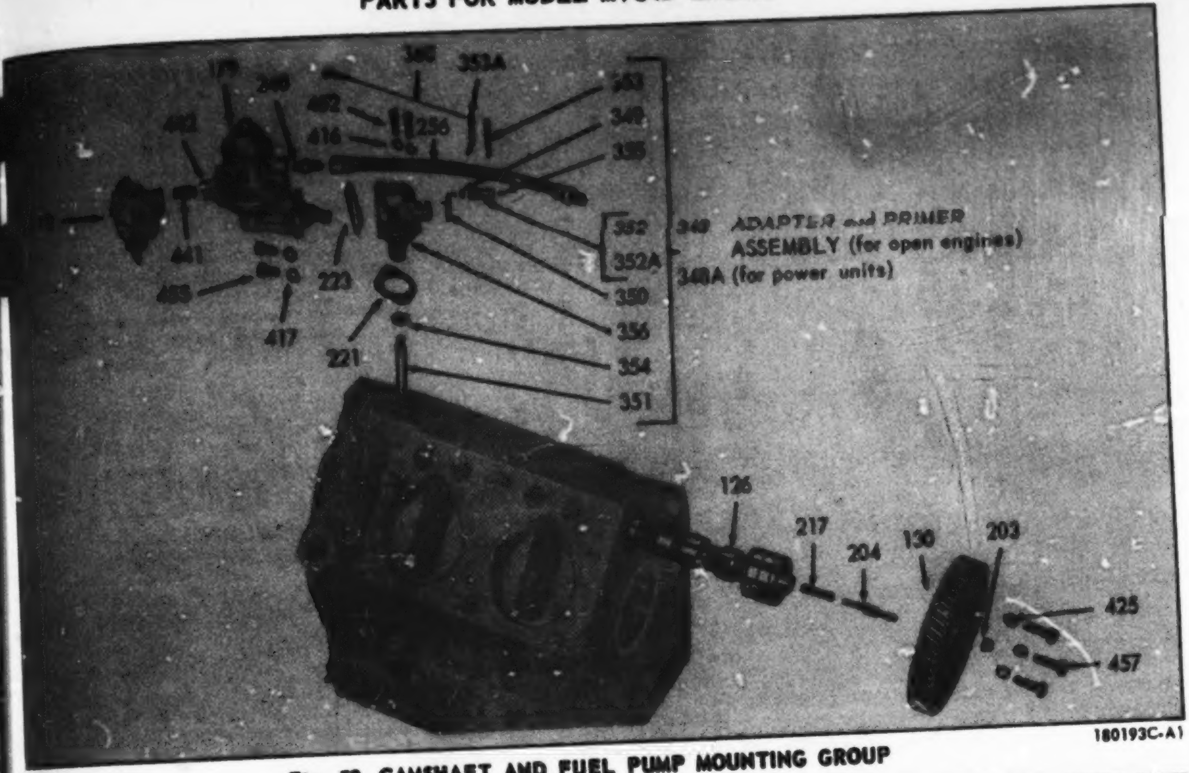
Parts are identified by reference number. See parts list for correct part number.


122
123
124
121
120
117
183
184
185
129
249
201
198
461
419

180189C-A

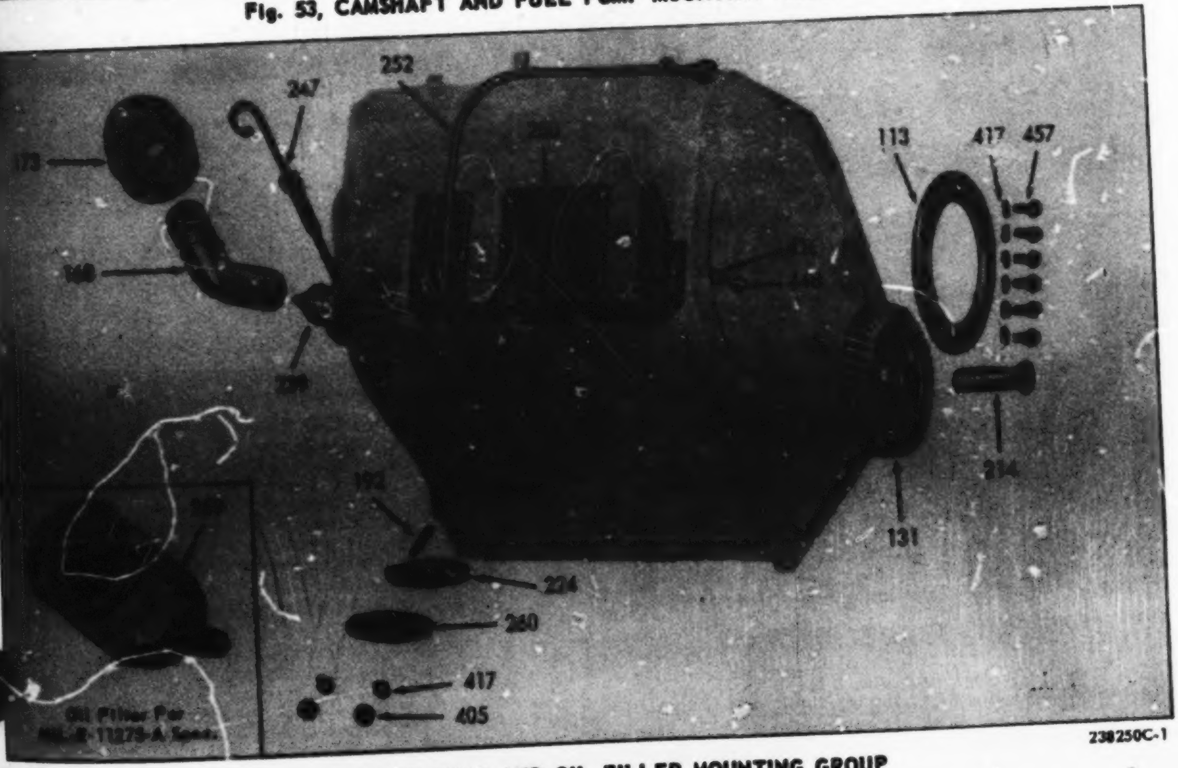
Fig. 52, CRANKSHAFT, PISTON AND CONNECTING ROD GROUP

Parts are identified by reference number. See parts list for correct part number.


353A
353
349
355
482
416
256
441
417
223
221
352
352A
349 ADAPTER and PRIMER ASSEMBLY (for open engines)
349A (for power units)
350
356
354
351
126
217
204
130
203
425
457

180193C-A1

Fig. 53, CAMSHAFT AND FUEL PUMP MOUNTING GROUP


252
247
173
113
417
457
214
131
192
224
260
417
405
Oil Filler Per MIL-E-11275-A Spec.

238250C-1

Fig. 54, IDLER GEAR AND OIL FILLER MOUNTING GROUP

Parts are identified by reference number. See parts list for correct part number.

PARTS FOR MODEL MVG4D ENGINE

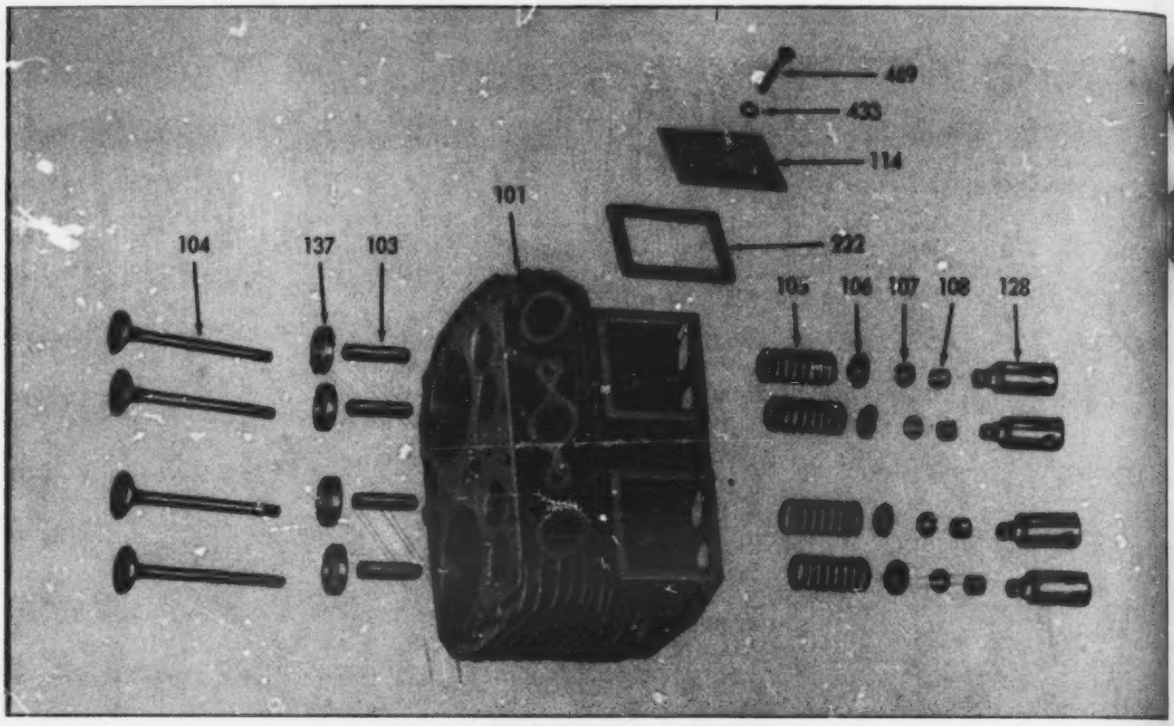

489
433
114
101
222
104
137
103
105
106
107
108
128

Fig. 55, CYLINDER BLOCK ASSEMBLY

187614C-A

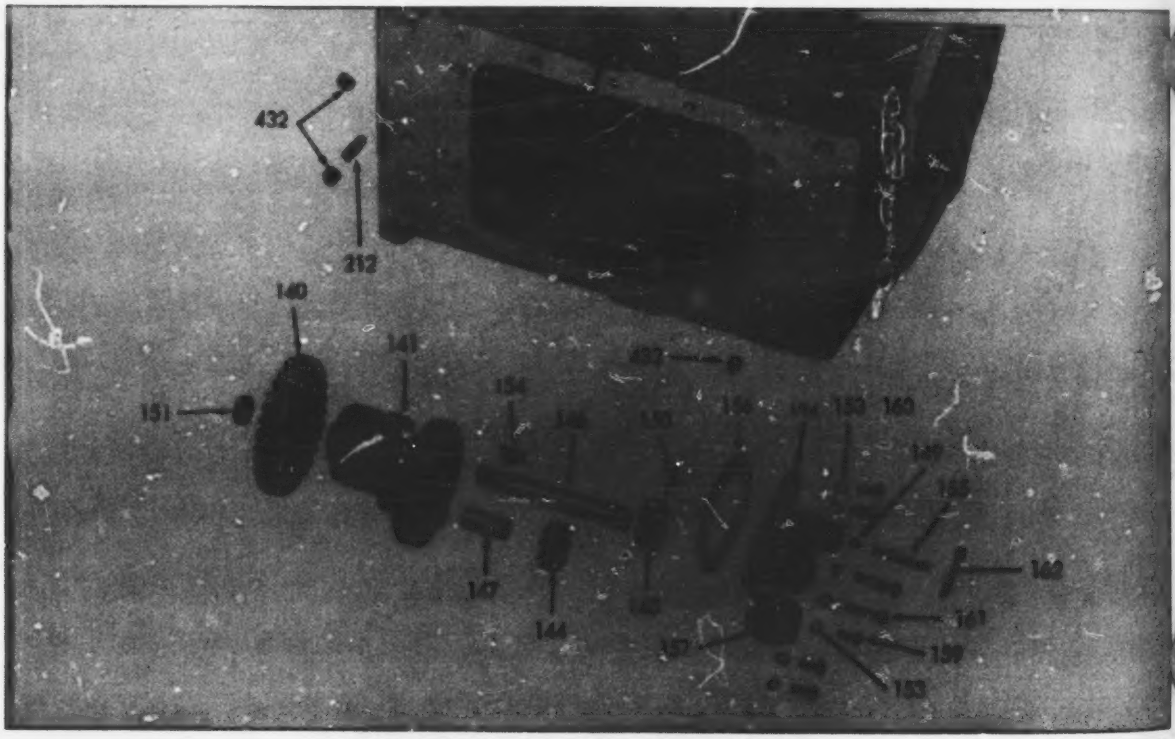

432
212
140
141
151
154
432
153
160
162
147
144
161
157
159
153

Fig. 56, Ref. No. 139, OIL PUMP ASSEMBLY

129786C-A

Parts are identified by reference number. See parts list for correct part number.

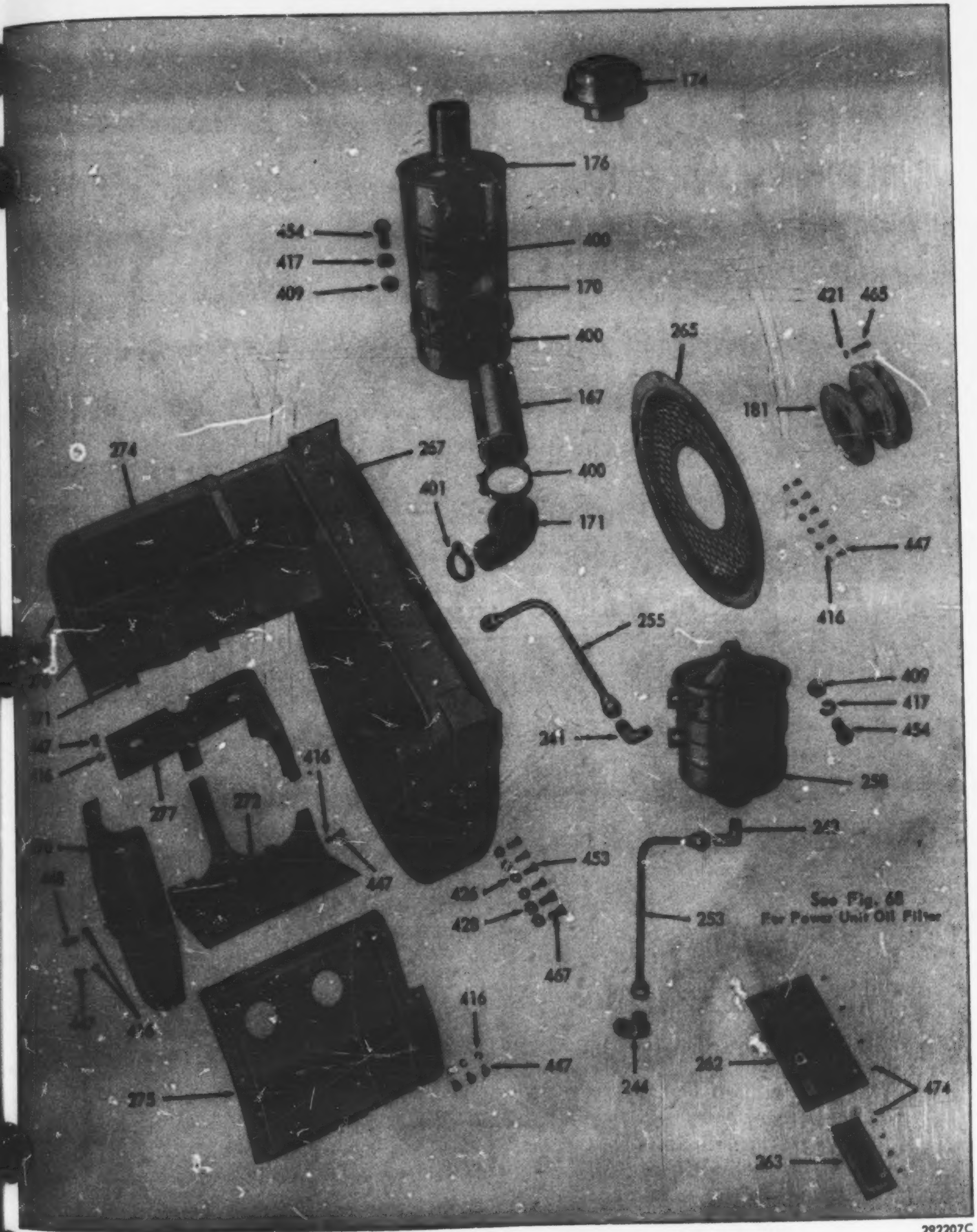

174
176
454
417
409
400
170
400
167
267
274
400
401
171
265
421
465
181
447
416
255
409
417
454
241
258
271
447
416
416
277
272
447
243
453
426
428
467
253
See Fig. 68
For Power Unit Oil Filter
416
447
275
244
262
474
263
292207C

Fig. 57, MILITARY OIL FILTER, AIR SHROUDING AND AIR CLEANER
Parts are identified by reference number. See parts list for correct part number

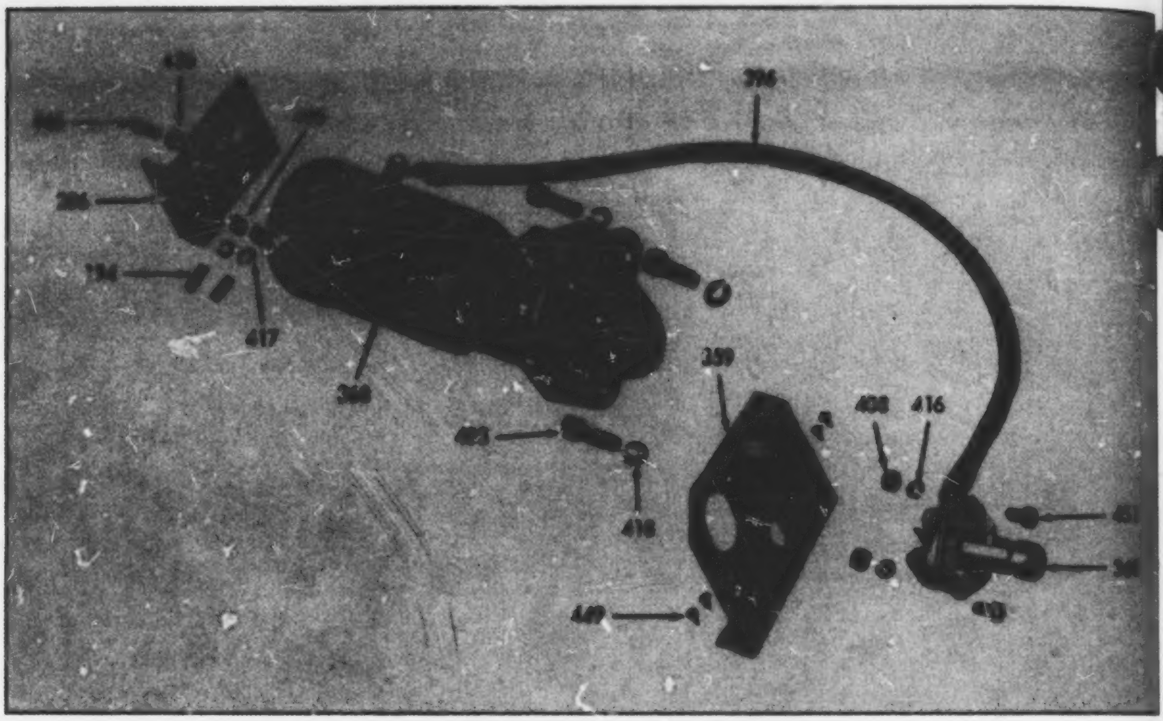
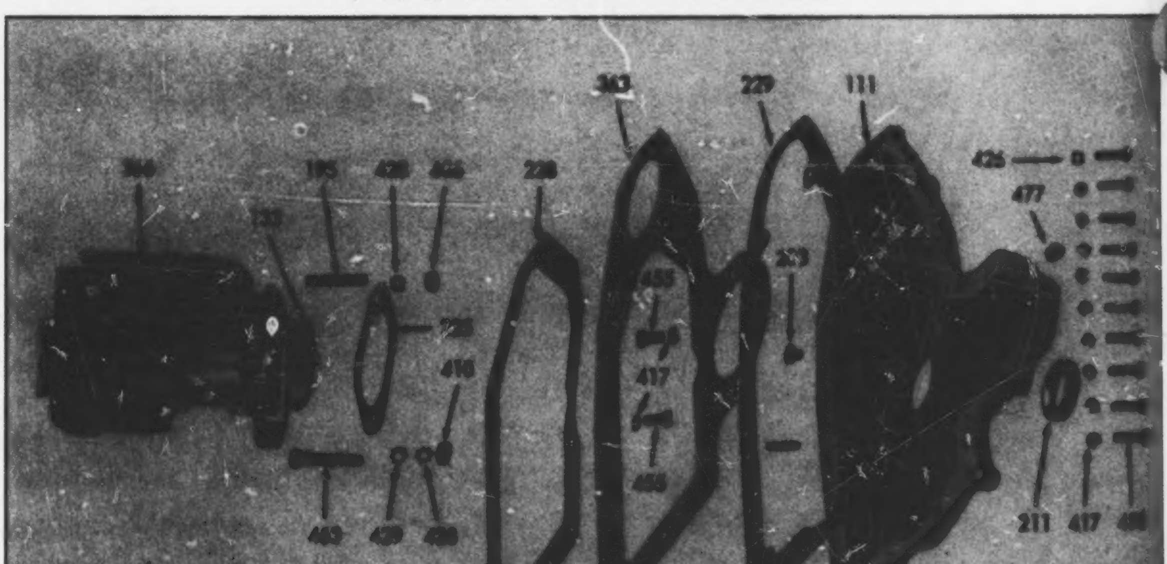

396
417
359
408
416
416
449

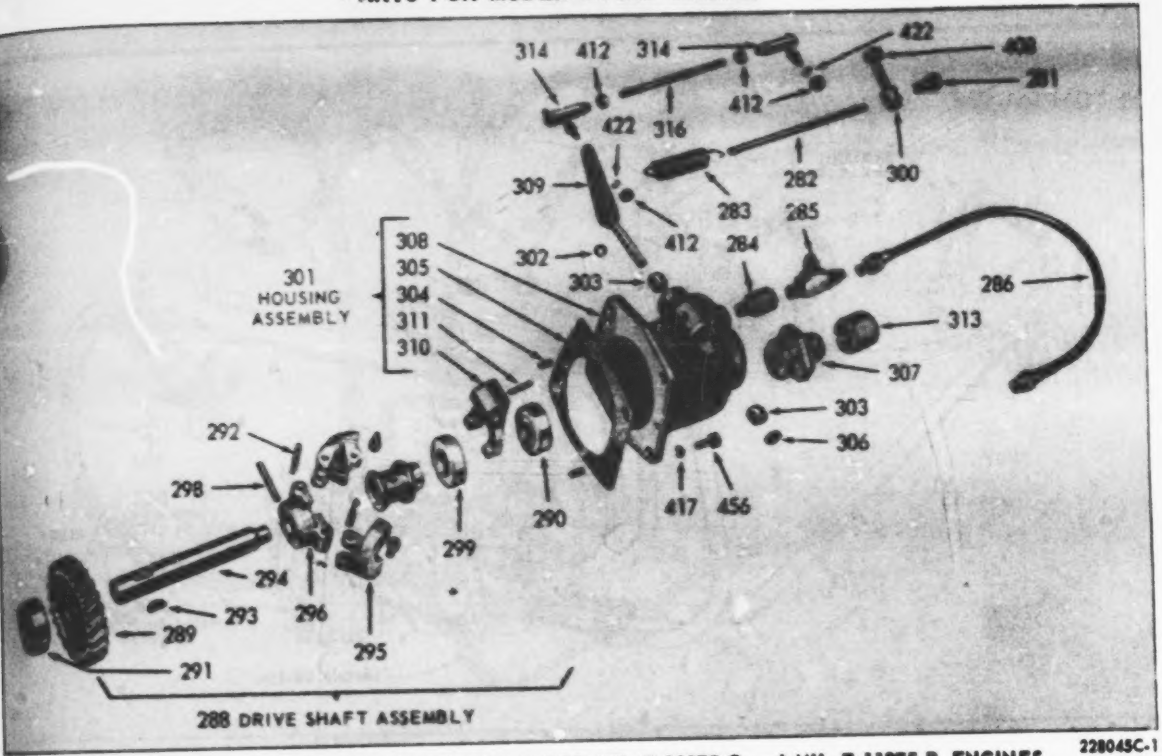
Fig. 58, ELECTRIC STARTER MOUNTING GROUP


362
229
111
195
228
425
477
455
417
223
211
417
188

189906C-1

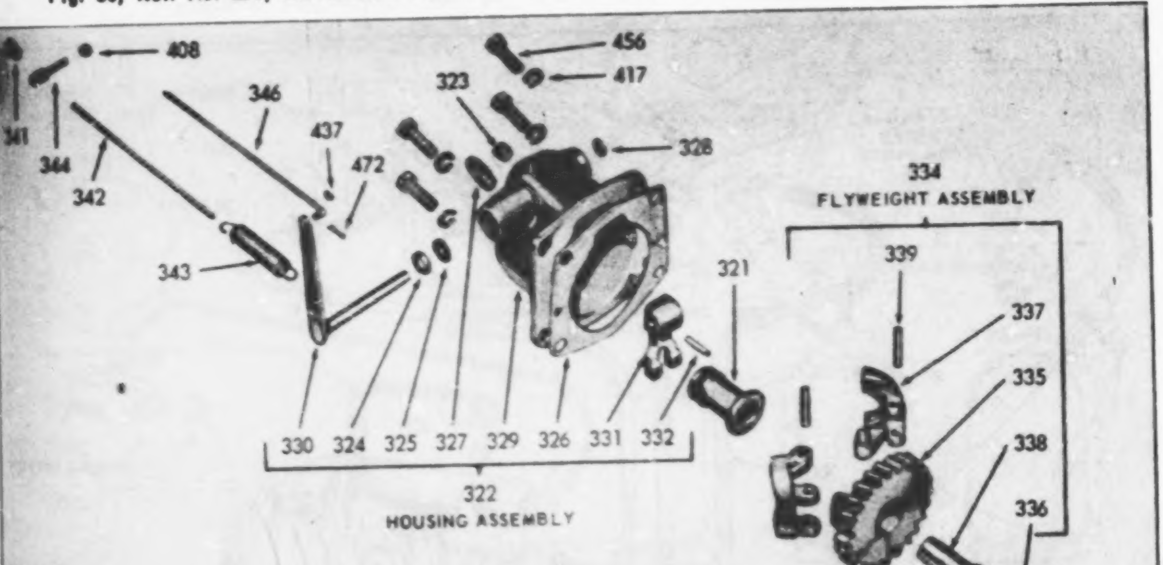
Fig. 59, MAGNETO AND GEAR COVER GROUP

Parts are identified by reference number. See parts list for correct part number.


314
412
314
422
408
281
412
422
316
282
300
309
283
285
412
284
301 HOUSING ASSEMBLY
308
305
304
311
310
302
303
286
313
307
303
306
292
298
290
417
456
299
294
296
293
289
295
291
288 DRIVE SHAFT ASSEMBLY

228045C-1

Fig. 60, Ref. No. 279, GOVERNOR ASSEMBLY FOR MIL-E-11275-C and MIL-E-11275-B ENGINES


408
456
417
341
344
342
346
437
472
323
328
334 FLYWEIGHT ASSEMBLY
343
339
321
337
335
330
324
325
327
329
326
331
332
338
336
322 HOUSING ASSEMBLY
345

129792C-1

Fig. 61, Ref. No. 320, GOVERNOR ASSEMBLY FOR MIL-E-11275-A ENGINES
Parts are identified by reference number. See parts list for correct part number.

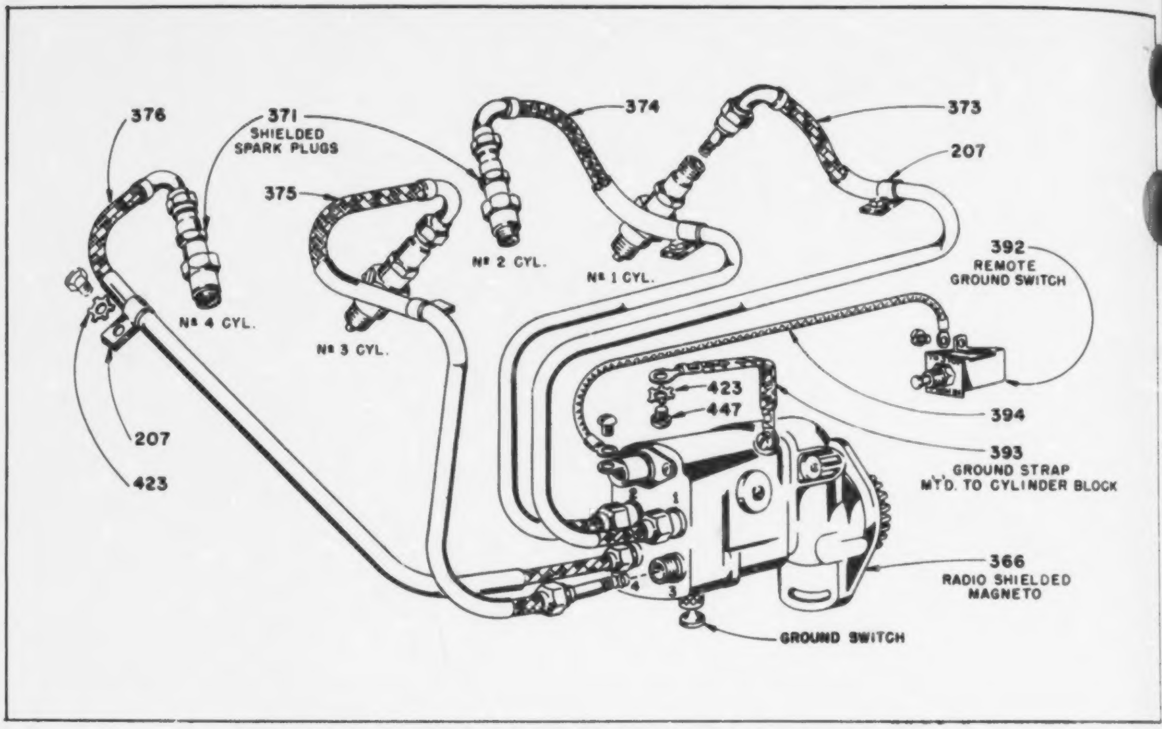

376
371
SHIELDED
SPARK PLUGS
374
373
207
375
Nº 2 CYL.
Nº 1 CYL.
392
REMOTE
GROUND SWITCH
Nº 4 CYL.
Nº 3 CYL.
423
447
394
207
393
GROUND STRAP
MT'D. TO CYLINDER BLOCK
423
2
1
4
3
366
RADIO SHIELDED
MAGNETO
GROUND SWITCH

Fig. 62, RADIO SHIELDED MAGNETO IGNITION FOR MIL-E-11275-C ENGINES

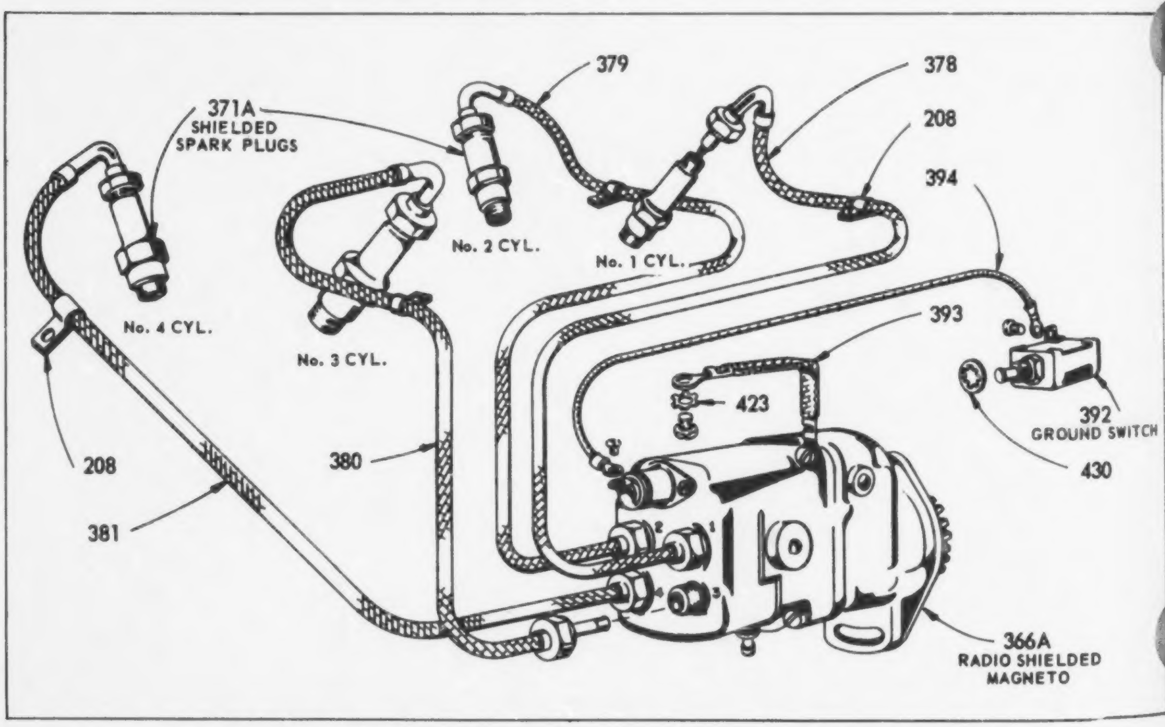

379
378
371A
SHIELDED
SPARK PLUGS
208
394
No. 2 CYL.
No. 1 CYL.
No. 4 CYL.
No. 3 CYL.
393
423
392
GROUND SWITCH
208
380
430
381
2
1
4
3
366A
RADIO SHIELDED
MAGNETO

Fig. 62A, RADIO SHIELDED MAGNETO IGNITION FOR MIL-E-11275-B ENGINES
Parts are identified by reference number. See parts list for correct part number.

PARTS FOR MODEL MVG4D ENGINE

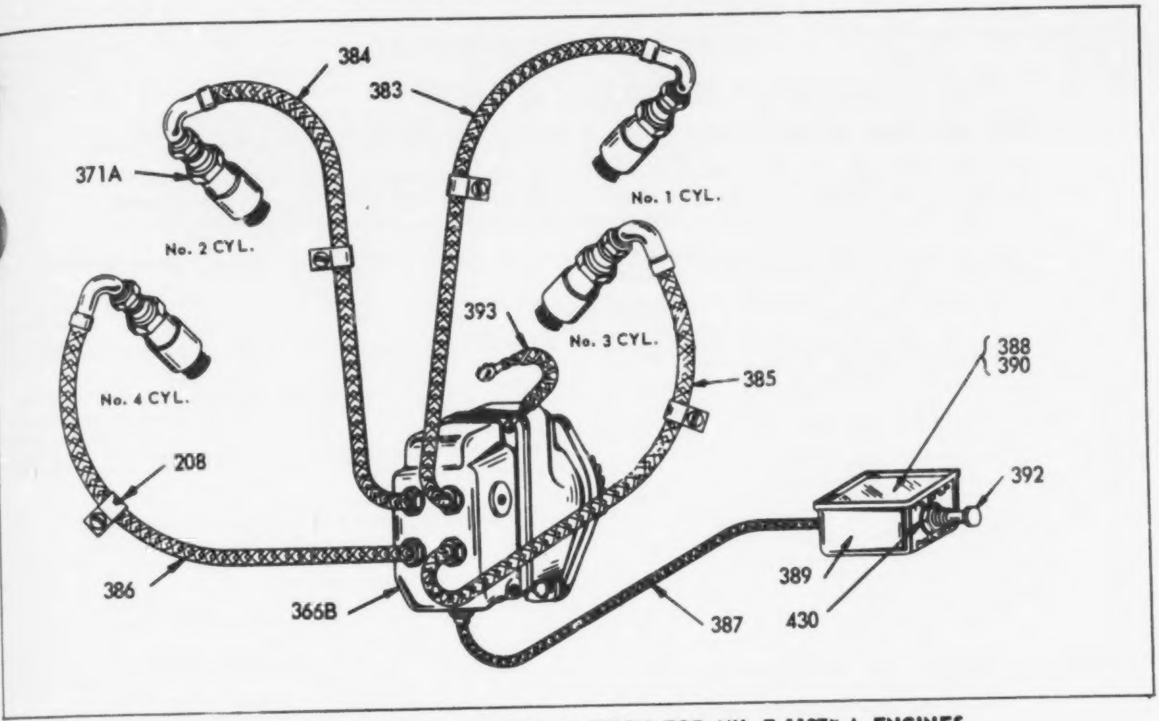

384
383
371A
No. 1 CYL.
No. 2 CYL.
393
No. 3 CYL.
No. 4 CYL.
388
390
385
208
392
389
386
366B
387
430

Fig. 62B, RADIO SHIELDED MAGNETO IGNITION FOR MIL-E-11275-A ENGINES

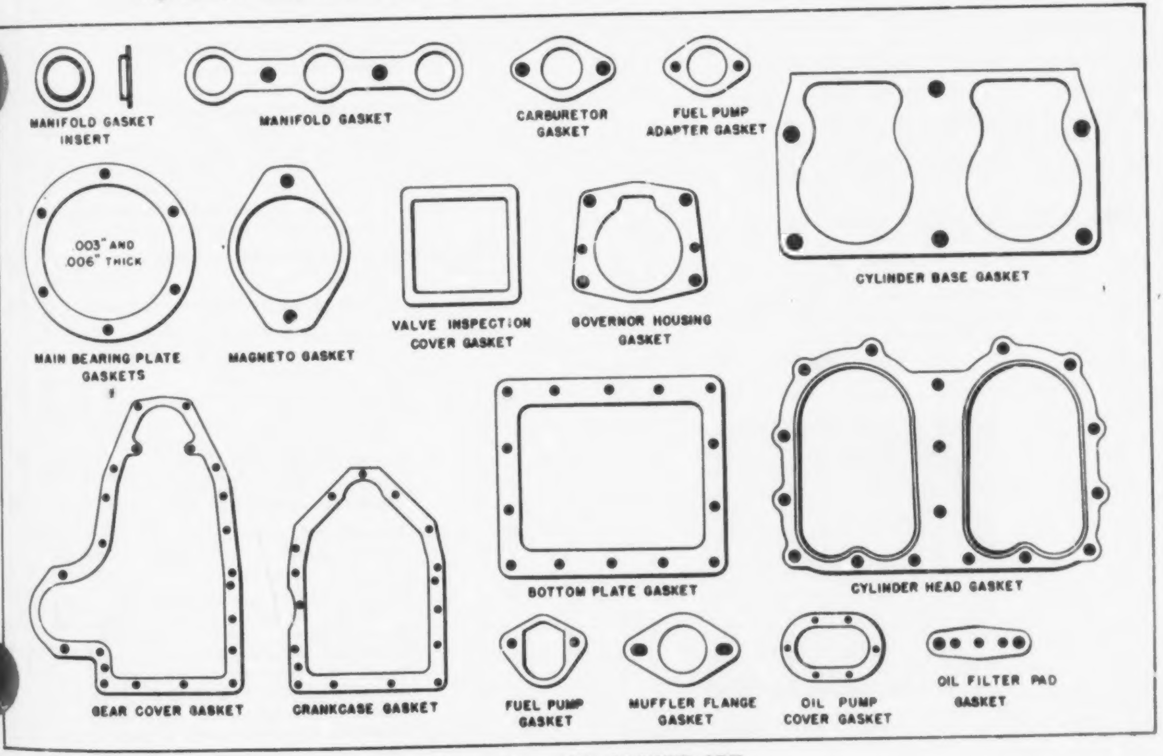

MANIFOLD GASKET INSERT
MANIFOLD GASKET
CARBURETOR GASKET
FUEL PUMP ADAPTER GASKET
CYLINDER BASE GASKET
.003" AND .006" THICK
MAIN BEARING PLATE GASKETS
MAGNETO GASKET
VALVE INSPECTION COVER GASKET
GOVERNOR HOUSING GASKET
BOTTOM PLATE GASKET
CYLINDER HEAD GASKET
GEAR COVER GASKET
CRANKCASE GASKET
FUEL PUMP GASKET
MUFFLER FLANGE GASKET
OIL PUMP COVER GASKET
OIL FILTER PAD GASKET

Fig. 63, Ref. No. 218, GASKET SET

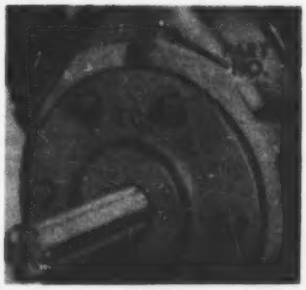
Parts are identified by reference number. See parts list for correct part number.

STANDARD ENGINE PARTS LIST
FOR MODEL MVG4D
PER MILITARY SPECIFICATIONS MIL-E-11275-C, MIL-E-11275-B and MIL-E-11275-A

This list is for a standard engine without house. If power unit house parts are required, refer to Page 45.

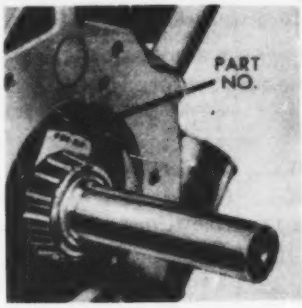
THE MS- NUMBERS IMMEDIATELY BELOW THE BOLD PART NUMBERS ARE MILITARY STANDARD NUMBERS FOR THE CORRESPONDING PART. THESE ARE INTERCHANGEABLE HIGH MORTALITY PARTS.

NOTE: Parts are interchangeable for these models of engines, except where noted by the Military Specification Numbers, MIL-E-11275-C, MIL-E-11275-B or MIL-E-11275-A.

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
101	**AA-90A-2-S1**	**CYLINDER BLOCK ASSEMBLY** .... Complete – consisting of: 1 AA-90A-2 Cylinder block 4 AD-42-A Valve stem guide 4 AE-84-D Valves 4 AF-49A Valve springs 4 AG-30 Spring Seats 4 AH-14 Retainer locks 4 AH-15 Valve stem rotator caps 2 BH-103 Valve inspection cover 4 HG-150-D Valve seat inserts 2 PC-251 Studs 2 PH-14 Washers 2 QD-482 Gaskets 2 XD-148 Screws	2	44	
102	**AB-97B-2-S1**	**CYLINDER HEAD** with plug inserts ...... AB-97A-S1 (MIL-E-11275-A) with heli-coil inserts, replaced by AB-97B-2-S1.	2	6	2
103	**AD-42-A**	**VALVE STEM GUIDE,** inlet and exhaust	8		2
104	**AE-84-D** **MS-13999-8**	**VALVE, STELLITE**	8		4
105	**AF-49-A**	**VALVE SPRING,** 2.312" free length	8		2
106	**AG-30**	**VALVE SPRING SEAT**	8		1
107	**AH-14** **MS-13997-1**	**LOCK** for valve spring seat	8 pr		1
108	**AH-15** **MS-13998-1**	**ROTATOR CAPS** for valve stems	8		1
110	**See Fig. A**	**CRANKCASE ASSEMBLY** .... Consisting of: 1 Crankcase 1 LJ-300-M Tube 1 RC-91 Screen 2 PC-111 Studs 4 RF-1121 Nozzles 2 PC-112 Studs 1 RJ-159 Saber 2 PC-396 Studs 1 RJ-159-A Saber 12 PC-435 Studs 2 SA-26 Plugs 8 PF-18 Plugs 1 SA-58 Plug	1	68	
		 **Fig. A** 76638C			
		NOTE: The basic standard crankcase part number is **BA-49-A.** Any special machining is indicated by a number stamped on the crankcase in the location shown in **FIG. A.** Add this number to **BA-49-A.** Order by complete number and by giving the Model, Specification and Serial Numbers of the engine.			
111	**BD-101-1-S1**	**GEAR COVER ASSEMBLY** for engines built to **MIL-E-11275-C, MIL-E-11275-B** specs. .... Consisting of: 1 BD-101-1 Cover 1 PF-52 Button 1 PH-269 Oil seal 1 SA-10 Plug 1 XK-3 Plug	1	15	
	BD-101-S1	For engines built to **MIL-E-11275-A** specification............ Consisting of: 1 BD-101 Gear cover 1 PF-52 Button 1 PH-269 Seal 1 TC-388-1 Shaft 1 XK-3 Plug		15	8
112	**BG-193A-S2**	**MAIN BEARING PLATE ASSEMBLY** .. Take-off end – consisting of: 1 BG-193-A Bearing plate 1 ME-98-1 Bearing cup 1 PH-202 Oil seal **NOTE:** Engines equipped with a clutch, or clutch reduction unit, require a special main bearing plate as specified in the rear section of this manual where these accessories are located.	1	6	
113	**BG-223**	**BEARING RETAINER PLATE** .... Flywheel end.	1		10
114	**BH-103**	**VALVE TAPPET INSPECTION COVER**	4		4
115	**BH-155-C**	**CRANKCASE BOTTOM COVER** .... For engines built to **MIL-E-11275-C** and **MIL-E-11275-B** Spec.	1	2	
	BH-155-A	For **MIL-E-11275-A** Spec. engines		2	
116	**BK-72-A**	**ENGINE SUPPORT,** 1-5/8" high, (cast iron) for engines built to **MIL-E-11275-C** and **MIL-E-11275-B** Spec.	2	6	
	BK-72	1-1/2" high, for engines built to **MIL-E-11275-A** Spec.		5	10
117	**See Fig. B**	**CRANKSHAFT ASSEMBLY** .... Consisting of: 1 Crankshaft 1 GA-35A-1 Gear 1 PL-49 Key 2 ME-98 Br'gs. 1 RK-173 Sling **NOTE:** The part number of the crankshaft will be found stamped on the cheek facing the take-off end of the shaft as illustrated in **FIG. B. ORDER BY THIS NUMBER** and by giving the Model, Specification and Serial Number of the engine.	1	53	

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

MODEL MVG4D PARTS LIST

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
		 Fig. B 71057C			
119	DA-66A-4-S1	**CONNECTING ROD ASSEMBLY** .... Consisting of: 1 DA-66A-4 Rod (Not serviced separately) 2 HA-120 Shell bearings 1 HG-221 Bushing 2 PB-146-1 Bolts 2 PD-11 Nuts 2 PD-182 Palnuts	4	3	8
120	DB-213-SP MS-13957-1	**PISTON ASSEMBLY,** standard size	4	1	3
	DB-213-SP-20 MS-13957-2	**PISTON ASSEMBLY,** .020" oversize			
	DB-213-SP-40 MS-13957-3	**PISTON ASSEMBLY,** .040" oversize .... **NOTE:** Piston assembly consists of piston pin and retainers.			
121	DR-25 DR-25-S20 DR-25-S40	**PISTON RING SET,** standard size .... **PISTON RING SET,** .020" oversize ...... **PISTON RING SET,** .040" oversize	1		10
122	DC-170 MS-13933-7	**COMPRESSION RING,** standard size .... No. 1 groove.	4		1
	DC-170-S20 MS-13933-8	**COMPRESSION RING,** .020" oversize ..			
	DC-170-S40 MS-13933-9	**COMPRESSION RING,** .040" oversize			
123	DC-171 MS-13932-7	**COMPRESSION RING,** standard size .... No. 2 groove.	4		1
	DC-171-S20 MS-13932-8	**COMPRESSION RING,** .020" oversize ..			
	DC-171-S40 MS-13932-9	**COMPRESSION RING,** .040" oversize ..			
124	DC-172 MS-13931-10	**OIL RING,** standard size .... No. 3 and 4 groove.	8		1
	DC-172-S20 MS-13931-11	**OIL RING,** .020" oversize			
	DC-172-S40 MS-13931-12	**OIL RING,** .040" oversize			
125	DE-71 MS-13996-2	**PISTON PIN**	4		3
126	EA-112	**CAMSHAFT**	1	4	
128	F-65	**VALVE TAPPET** with PB-169A lock-screw	8		4
129	GA-35A-1	**CRANKSHAFT GEAR**	1	1	
130	GB-46	**CAMSHAFT GEAR**....................................	1	2	14
131	GC-28	**IDLER GEAR**	1	2	1
133	GD-103-1	**MAGNETO GEAR**	1		13
134	GH-43	**RING GEAR,** flywheel starter	1	2	
135	HA-120 MS-13993-1	**CONNECTING ROD SHELL BEARINGS**	8		2
137	HG-150-D	**VALVE SEAT INSERT,** Stellite	8		1
138	HG-221 MS-13963-1	**PISTON PIN BUSHING**...........................	4		1
139	K-95-L	**OIL PUMP ASSEMBLY,** complete (Fig. 56)... K-95-D, replaced by K-95-L. **NOTE:** Beginning with Serial No. 3795557, the K-95-L oil pump replaces K-95-D and utilizes the same internal gears for both the drive and driven gears. Therefore, driven gear and stub shaft for old pumps are not interchangeable since gear bore diameters are not the same. Pump assembly consists of:	1	3	13
140		**GD-94-C** Oil Pump Drive Gear (external)	1		11
141		**KA-61-C-S1** Body — Includes: KC-56A Gear KD-122A Shaft KA-61A-1-S1, replaced by KA-61C-S1.	1	2	
142		**KB-42-S2** Cover Assembly, includes relief valve and screen	1		11
143		**KC-56-A** Driver Gear .... KC-56-1, replaced by KC-56-A.	.1		1
144		**KC-56-A** Driven Gear, .499—.498 I.D. beginning with Serial No. 3795557. .... KC-56-2 (K-95D pump) .5015—.5005 I.D. previous to Serial No. 3795557. For replacement use KC-56A-1.	1		1
146		**KD-121-S1** Drive Shaft with KC-56-A gear	1		4
147		**KD-122-A** Stub Shaft, for engines beginning with Serial No. 3795557 .... KD-122 (K-95D pump) previous to engine No. 3795557, no longer available, order KA-61C-S1 Body Assembly.	1		2
149		**ME-60** Check Ball, 1/4" dia. steel	1		1
150		**PA-64** Pin, 1/8" dia. x 3/4" long steel straight, for driver gear	1		1
151		**PD-195** Jam Lock-Nut, 7/16"-20 thread For gear mounting.	1		1
153		**PE-14** Lockwasher, No. 10 Positive .... 6-for cover 1-for screen	7		1
154		**PL-137** Key, No. 1 Woodruff .... For drive gear.	1		1
155		**PM-111** Spring for relief valve	1		1
156		**QD-535** Cover gasket	1		1
157		**RD-112** Screen..	1		1
159		**XA-7** Screw for screen, No. 10-32 thread x 3/8" long steel round head	1		1

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

MODEL MVG4D PARTS LIST

Ref. No.	Part Number	Description	No. Req	Net Wt.	
				Lb	Oz
160		**XA-8** Screw for cover, No. 10-32 thread x 1/2" long steel round head	4		1
161		**XA-56** Screw for cover, No. 10-32 thread x 1-1/4" long steel round head	2		1
162		**XI-16** Cotter Pin for valve, 1/8" x 1"	1		1
164	**L-54J-3-S1**	**CARBURETOR** with gasket (for **MIL-E-11275-C** and **MIL-E-11275-B** Spec engines same as Marvel-Schebler VH-69 (Wis. Motor No. L-54-J-1) but with swivel block removed from throttle lever for ball joint.			
	Optional **L-57-2-S1**	**CARBURETOR,** same as Zenith Model 87A8, No. O-11532 (Wis. Motor No. L-57-1) but with swivel block removed from throttle lever for ball joint. **L-54J-1-S1** or **L-57-1-S1** for **MIL-E-11275-A** engines. **NOTE:** Refer to L-54J-1 or L-57-1 bulletins in rear of manual for service parts lists.			
165	**LD-240-19-S1**	**INLET** and **EXHAUST MANIFOLD** With plugs.	1	19	
166	**LF-131**	**FLANGED MUFFLER ADAPTER** (male) Refer to Fig. 65 for female adapter.	2	1	
167	**LJ-131-3**	**TUBE** for air cleaner connection on **MIL-E-11275-C** Spec engines	1		6
168	**LJ-300-M**	**OIL FILLER TUBE**	1		12
170	**LL-18**	**RUBBER HOSE** for air cleaner on **MIL-E-11275-C** Spec engines	1		3
171	**LL-89-2**	**RUBBER ELBOW** for air cleaner on **MIL-E-11275-C** Spec engines	1		6
173	**LO-60-1**	**CAP** for oil filler and breather	1		6
174	**LO-62**	**AIR STACK CAP**	1	1	
176	**LO-138-S1** **MS-35875-3**	**AIR CLEANER** (6" dia.) Donaldson Co. No. **KAX00-0354** or-0405 for engines built to **MIL-E-11275-C** spec. For MIL-E-11275-B and MIL-E-11275-A spec engines, refer to Page **53,** Fig. 70. Service parts: Donaldson part numbers. – – – – Body assembly – not serviced separately, order complete air cleaner.	1	6	
		P10-1362 Oil cup clamp assembly	1		3
		P10-1360 Oil cup assembly (inner)	1		6
		P10-1361 Cup gasket	1		1
		P-17703 Oil cup (outer)	1		10
		AAH00-0343 Mounting band assembly	2		8
178	**LP-19** **MS-51086**	**FUEL STRAINER,** Tillotson **OW-418-T** **NOTE:** See illustration in accessory section of manual for service parts list of fuel strainer.	1		6
179	**LP-38-C**	**FUEL PUMP**	1	1	11
	LQ-30-A	**REPAIR KIT** for fuel pump **NOTE:** Refer to fuel pump instruction sheet in back of manual for maintenance and repair. LQ-21-E, replaced by LQ-30-A.	1		3
181	**MD-285-1**	**GENERATOR DRIVE SHEAVE**	1	5	13

Ref. No.	Part Number	Description	No. Req	Net Wt.	
				Lb	Oz
183	**ME-98**	**MAIN BEARING ASSEMBLY** Consisting of:	2	2	1
184		**ME-98-1** Cup	1		15
185		**ME-98-2** Cone	1	1	12
186	**NC-146C-2-S1**	**FLYWHEEL,** Standard Consisting of: 1 GH-43 Ring gear 1 NC-146C-2 Flywheel	1	48	
188	**PA-291**	**DOWEL PIN** for gear cover to case	2		1
189	**PA-334**	**PIN** in crankshaft for hand crank	1		1
191	**PB-146-1-S1**	**CONNECTING ROD BOLT ASSEMBLY** Consisting of: 1 PB-146-1 Bolt 1 PD-11 Nut 1 PD-182 Palnut	8		2
192	**PC-112**	**STUD** for oil filter or pad cover	2		1
193	**PC-251**	**STUD** for mounting manifold to cylinder block	4		1
194	**PC-396**	**STUD** for mounting starter bracket	2		1
195	**PC-429**	**STUD** for mounting magneto (upper hole)	1		2
196	**PC-435**	**STUD** for mounting cyl. block to case	12		2
198	**PD-157**	**NUT** for mounting flywheel	1		2
199	**PD-182**	**PALNUT** for connecting rod bolts, 3/8"-24	8		1
201	**PE-65-1**	**STAR LOCKWASHER** For mounting flywheel.	1		1
203	**PF-52**	**CAMSHAFT THRUST PLUNGER BUTTON**	1		1
204	**PF-101**	**CAMSHAFT THRUST PLUNGER**	1		1
206	**PG-515-A**	**STARTER SUPPORT BRACKET**	1		
207	**PG-558**	**CLIP** (1/2" I.D.) for shielded cable, on **MIL-E-11275-C** Spec engines	4		
208	**PG-630**	**CLIP** (3/8" I.D.) for shielded cable, on **MIL-E-11275-B, MIL-E-11275-A** engines	4		1
210	**PH-202**	**MAIN BEARING OIL SEAL,** take-off end	1		3
211	**PH-269**	**MAIN BEARING OIL SEAL** flywheel end	1		2
212	**PI.143-B**	**OIL PUMP LOCKSCREW**	1		1
214	**PJ-105**	**STUD** for idler gear	1		5
215	**PK-106** **MS-13962-1**	**RETAINING RING** for piston pin	8		1
217	**PM-108**	**SPRING** for camshaft thrust plunger	1		1
218	**Q-18-B**	**GASKET SET** (Fig. 63) Consisting of: 6 QB-83 1 QD-595-A 1 QD-634 2 QC-62 1 QD-615-A 1 QD-635 1 QD-67 1 QD-616 2 QD-636-A 4 QD-482 2 QD-631 1 QD-636-B 1 QD-535 2 QD-632 1 QD-727 1 QD-538-A 1 QD-633 1 QF-91 Q-18-A, replaced by Q-18-B.	1		1
	Q-27	**VALVE GRINDING GASKET SET** Consisting of: 2 QB-83 2 QD-631 2 QC-62 4 QD-482	1		1

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

MODEL MVG4D PARTS LIST

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
219	QB-83	**INSERT** for manifold gasket	8		1
220	QC-62	**GASKET** for manifold to cylinder block	2		1
221	QD-67	**GASKET** for fuel pump adapter	1		1
222	QD-482	**GASKET** for valve inspection cover	4		1
23	QD-538-A	**GASKET** for mounting fuel pump	1		1
224	QD-595-A	**GASKET** for oil filter or pad cover	1		1
225	QD-616	**GASKET** for mounting magneto	1		1
226	QD-631	**GASKET** for cylinder head	2		1
227	QD-632	**GASKET** for cylinder base	2		1
228	QD-633	**GASKET** for crankcase to spacer	1		1
229	QD-634	**GASKET** for gear cover	1		1
230	QD-635	**GASKET** for crankcase bottom cover	1		1
231	QD-636-A	**GASKET** for bearing plate—take-off end, .003" thick	2		1
232	QD-636-B	**GASKET** for bearing plate—take-off end, .008" thick	1		1
234	QD-727	**GASKET** for muffler adapter flange	1		1
235	QF-67-B	**SHIM** for bearing plate—take-off end, .006" thick	2		1
236	QF-67-C	**SHIM** for bearing plate—take-off end, .014" thick	3		1
237	QF-91	**SPACER GASKET** for carburetor	1		2
239	RC-91	**OIL FILLER SCREEN**	1		1
240	RF-269	**STRAIGHT FITTING** for fuel pump outlet	1		1
241	RF-270-4	**RESTRICTED ELBOW** for military oil filter inlet	1		1
242	RF-1121	**OIL SPRAY NOZZLE**	4		1
243	RF-1225	**ELBOW** for fuel line 1-for oil filter drain line. 1-for oil line to governor, in crankcase RF-270, replaced by RF-1225.	2		2
244	RF-1343	**ELBOW** in gear cover, for Military oil filter return line	1		2
246	RJ-159	**OIL SABER** (short) starter side Includes: **PH-550** felt washer. RJ-143-S1, replaced by RJ-159.	1		2
247	RJ-159-A	**OIL SABER** (long) below oil filler tube. Includes: **PH-550** felt washer. RJ-153A-S1 (with PH-245 cork washer), replaced by RJ-159-A.	1		3
249	RK-173	**OIL SLING** for crankshaft	1		2
250	RK-181	**CRANKCASE SPLASH PLATE**	2		4
252	RM-536	**OIL LINE,** crankcase to governor 1/4" tubing 19-1/2" long, with nuts	1		4
253	RM-772	**OIL RETURN LINE** for Military oil filter to gear cover, 1/4" tubing, 12" long with nuts	1		2
255	RM-1161	**OIL PRESSURE LINE** for Military oil filter to governor, 1/4" tubing 22-1/2" long with nuts	1		4
256	RM-1319-L	**FLEXIBLE FUEL LINE,** pump to carburetor 17" long RM-1201-A and RM-1319-B, replaced by RM-1319-L.	1		4
258	RV-28	**MILITARY OIL FILTER** From No. **F-21P.** For **MIL-E-11275-C** and **MIL-E-11275-B** Spec engines. See illustration in rear of manual for service parts list and instructions.	1	6	
259	- - - - -	**OIL FILTER** (commercial type) For **MIL-E-11275-A** Spec engines. Consisting of:	1	1	12
		RV-40-S4 CARTRIDGES (4 pack)	1	3	4
		RV-40A-1 BASE ASSEMBLY	1	1	
		NOTE: Beginning with engine Serial No. 3408750, the RV-29-A oil filter is replaced by a **BASE** and **CARTRIDGE** listed above. Replacement cartridges are not interchangeable, therefore RV-29-S4 cartridges must be used for obsolete RV-29-A oil filter. Part number is located on top of cartridge for identification.			
260	SA-65-C	**COVER PLATE** for oil filter pad On **MIL-E-11275-C** and **MIL-E-11275-B** engines.	1		2
262	SD-252	**ENGINE INSTRUCTION AND NAME PLATE** When ordering name plate, give Model, Specification Number and Serial Number for correct stamping.	1		1
263	SD-197-B	**MILITARY IDENTIFICATION PLATE** For **MIL-E-11275-C** Spec engines.	1		1
	SD-197-A	For **MIL-E-11275-B** Spec engines.			
	SD-197	For **MIL-E-11275-A** Spec engines.			
265	SE-48-1	**SCREEN** for flywheel shroud	1	1	1
267	SE-124-AG	**FLYWHEEL SHROUD** for standard open engine with pads for starter, Military air cleaner and oil filter	1	16	8
	SE-124-A	For power units (with starter pad)		15	8
		NOTE: The above are flywheel shrouds for the **MIL-E-11275-C** Spec engines. Because of the various combinations of accessory mounting pads for the **MIL-E-11275-B** and **MIL-E-11275-A** engines, order by giving **Model, Specification** and **Serial Numbers** of engine.			
269	SE-125	**REAR SHROUD COVER,** R.H. side	1	1	3
270	SE-125-A	**REAR SHROUD COVER,** L.H. side	1	1	3
271	SE-126	**LOWER CYLINDER SHROUD,** R.H. side	1		14
272	SE-126-A	**LOWER CYLINDER SHROUD,** L.H. side	1		14
274	SE-127	**CYLINDER HEAD SHROUD,** R.H. side	1	1	2
275	SE-127-A	**CYLINDER HEAD SHROUD,** L.H. side	1	1	2
276	SE-128-B	**CYLINDER HEAT DEFLECTOR,** R.H. side	1	1	
277	SE-128-C	**CYLINDER HEAT DEFLECTOR,** L.H. side	1	1	
279	T-84-H-1	**GOVERNOR ASSEMBLY** for engines built to **MIL-E-11275-C** and **MIL-E-11275-B** Spec Consisting of:	1	7	
281		**PD-173-A** Nut for adjusting screw	1		1
282		**PI-145** Adjusting screw	1		3

IMPORTANT: Always give **Model, Specification** and **Serial Numbers** as shown on name plate.

MODEL MVG4D PARTS LIST

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
283		**PM-76** Governor spring	1		2
284		**RF-1165-A** Restricted oil line fitting	1		1
285		**RF-1281** Tee for oil line	1		1
286		**RM-536** Oil line, case to governor	1		4
288		**TA-112A-S1** Drive shaft assembly	1	2	8
		Consisting of:			
289		**GD-95-A** Gear	1		9
290		**ME-111** Housing bearing	1		6
291		**ME-112** Shaft Bearing	1		6
292		**PA-340** Roll pin for flyweight	2		1
293		**PL-21** Key, Woodruff No. 3	1		1
294		**TA-112-A** Drive shaft	1		6
295		**TC-322D-S1** Flyweight with TC-328D thrust pin	2		3
296		**TC-346-B** Flyweight hub	1		4
298		**XH-9** Taper pin for flyweight hub, No. 2 x 1¼" long	1		1
299		**TC-348-S1** Thrust sleeve and bearing assembly	1		6
		TC-348A-S1, replaced by TC-348-S1.			
300		**TC-367-A** Adjusting screw pin	1		1
301		**TC-363B-2-S1** Housing assembly	1	3	
		Consisting of:			
302		**JK-52** 'O' Ring for cross shaft	1		1
303		**ME-153** Bearing for cross shaft	2		1
304		**PA-294** Dowel pin for housing	2		1
305		**QD-615-A** Gasket for housing	1		1
306		**SA-26** Expansion plug, 5/8"	1		1
307		**TB-109** Tachometer adapter	1		6
308		**TC-363B-2** Housing	1	2	
309		**TC-398-15** Shaft and lever with JK-52 'O' ring	1		2
310		**VB-98A-5** Yoke	1		2
311		**XH-1** Taper pin, No. 0 x ¾" long	1		1
313		**TC-403** Cap for tachometer adapter	1		3
314		**VE-674-A** Ball joint for control rod	2		1
316		**VE-689-A** Control rod, 2¼" long, lever to carb. (with Marvel-Schebler carburetor)	1		1
		VE-689-C (With Zenith carburetor), 1-15/16" long	1		1
320	T-89-7-S1	**GOVERNOR ASSEMBLY**	1	3	3
		For **MIL-E-11275-A** Spec engines.			
		Consisting of:			
321		**TC-391-B** Thrust sleeve and bearing	1		2
		TC-391 & TC-391A, replaced by TC-391B.			
322		**TC-395-S1** Housing assembly	1	2	2
		Consisting of:			
323		**PF-18** Pipe plug—1/8" slotted	1		1
324		PF-118 Retainer, replaced by PH-571.			
325		**PH-571** Oil seal—replaces PF-118 Retainer and PH-318-A Seal			
326		**QD-615A** Housing gasket	1		1
327		**RF-269-2** Straight fitting	1		1
328		**SA-52** Plug—1/2" expansion	1		1
329		**TC-395** Housing	1	1	14
330		**TC-398** Cross shaft and lever	1		2
331		**VB-151** Yoke	1		3
332		**XH-1** Pin for yoke—No. 0 x 3/4" long taper	1		1
334		**TC-405 FLYWEIGHT ASSEMBLY**	1	1	
		Includes:			
335		**GD-100A** Gear	1		7
336		**PH-313A** Bushing washer	1		1
337		**TC-322D-S1** Flyweight assembly	2		3
		Includes:			
		TC-322-A, replaced by TC-322D-S1.			
338		**TC-389A-1** Gear Bushing	1		2
		TC-389-1, replaced by TC-389A-1.			
339		**PA-340** Flyweight roll pin	2		1
		XJ-47 Rivet or PA-265 Pin with 2 XI-33 Cotter Pins replaced by PA-340, but drill out holes in governor gear to .196 (No. 9 drill).			
		NOTE: The following governor linkage parts are not included in the T-89-7-S1 governor assembly.			
341		**PD-173A** Governor adjusting screw nut	1		1
342		**PI-145** Governor adjusting screw	1		3
343		**PM-76** Governor spring	1		1
344		**TC-367-A** Adjusting screw pin	1		1
345		**TC-388-1** Governor drive shaft	1		3
346		**VE-549** Governor control rod	1		1
348	TF-96-4	**FUEL PUMP ADAPTER** and **PRIMER ASSEMBLY** (with straight handle, for open engines.) Consisting of:	1	1	
349		**JK-50** 'O' Packing ring	1		1
350		**PM-145** Spring	1		1
351		**TA-111-A** Plunger (TA-116 must also be ordered)	1		1
352		**TA-114-S1** Shaft with JK-50 packing	1		1
353		**TA-115** Handle	1		1
354		**TA-116** Cap	1		1
356		**- - - -** Adapter, not serviced separately, order complete Adapter assembly.	1		1
348A	TF-96-7	**ADAPTER** and **PRIMER ASSEMBLY** (with bent handle for power units with fuel pump.) Consisting of:	1	1	
349		**JK-50** 'O' Packing ring	1		1
350		**PM-145** Spring	1		1
351		**TA-111-A** Plunger (TA-116 must also be ordered)	1		1
352A		**TA-114C-S1** Shaft with JK-50 Packing	1		1
353A		**TA-115-4** Handle	1		1
354		**TA-116** Cap	1		1
355		**XE-65** Set screw	1		1
356		**- - - -** Adapter, not serviced separately, order complete Adapter assembly.	1		1
358	U-226-A	**STARTING CRANK**	1	2	4
359	VE-439-D	**CONTROL PANEL**	1		6
		VE-559, replaced by VE-439-D.			
360	VE-471-4	**PRIMER CONTROL**	1		1
		For power units with fuel pump.			
361	VE-693-1	**CHOKE CONTROL**	1		4
362	WD-47	**MUFFLER** for 1½" pipe tap	1	3	
363	WE-243	**GEAR COVER SPACER**	1	2	4
		WE-243-1, replaced by WE-243.			
364	XK-7-B	**PLUG,** 3/4" pipe, hex. head, magnetic For oil drain on **MIL-E-11275-C** and **MIL-E-11275-B** Spec engines.	1		2
	XK-4-B	1/2" pipe plug for **MIL-E-11275-A** Spec	1		1

NOTE: The radio shielded ignition system for these models of engines is different for each of the three Military specifications the engines are built to. The latest Military Specification **MIL-E-11275-C**, specifies a radio shielded magneto adaptable to Military standard ignition wires and spark plugs.

Engines built to Specification **MIL-E-11275-B** can use the latest shielding when service replacement becomes necessary, but all three items: **MAGNETO, SPARK PLUGS** and **WIRE ASSEMBLIES** must be used.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

MODEL MVG4D PARTS LIST

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
		Engines built to **MIL-E-11275-A** Specification have a shielded ground wire and switch assembly, but are otherwise similar to MIL-E-11275-B spec engines.			
366	Y-98-C-S1	**RADIO SHIELDED MAGNETO** with gear and gasket. Fairbanks-Morse No. **FMXZE4B7-4.** For engines built to **MIL-E-11275-C** specification.	1	7	10
366A	Y-98-A-S1	Fairbanks-Morse No. **FMXZE4B7** mag. For engines built to **MIL-E-11275-B** spec.		7	10
366B	Y-98-S1	Fairbanks-Morse No. **FMXE4B7-G** .... For engines built to **MIL-E-11275-A** spec. **NOTE:** For replacement, Y-98A-S1 can be used, but omit shielded ground wire. See magneto bulletin in back of manual for service replacement parts lists.		7	
368	YA-20-A-1	**ELECTRIC STARTER** (24 volt), Presto-Lite No. MBP-4012T .... **NOTE:** For service repair parts of starting motor, refer to illustration in rear section of manual.	1	17	
369	YC-10-C	**STARTING SWITCH**	1		4
371	YD-311-S1 (MS-51009-1)	**SPARK PLUG,** Champion No. **XMD-21** .. For engines built to **MIL-E-11275-C** spec.	4		6
371A	YD-171-S1	**SPARK PLUG,** Champion No. **XED-16** .. For engines built to **MIL-E-11275-B** and **MIL-E-11275-A** specifications.			6
		The following Shielded Ignition Wire Assemblies are for engines built to **MIL-E-11275-C** Specification.			
373	YD-300-32 (MS-51011-13)	For No. 1 cylinder	1		
374	YD-300-40 (MS-51011-14)	For No. 2 cylinder	1		
75	YD-300-23 (MS-51011-10)	For No. 3 cylinder	1		
376	YD-300-32 (MS-51011-13)	For No. 4 cylinder	1		
		The following Shielded Ignition Wire Assemblies are for engines built to **MIL-E-11275-B** Specification.			
378	YD-213-H	For No. 1 cyl. (27-1/2" loom length)	1		4
379	YD-213-J	For No. 2 cyl. (39-1/2" loom length)	1		6
380	YD-213-K	For No. 3 cyl. (21" loom length)	1		4
381	YD-213-L	For No. 4 cyl. (30-1/2" loom length)	1		5
		The following Shielded Ignition Wire Assemblies and Ground Switch Box are for engines built to **MIL-E-11275-A** Specification.			
383	YD-213-H	For No. 1 cyl. (27-1/2" loom length)	1		4
384	YD-213-J	For No. 2 cyl. (39-1/2" loom length)	1		6
385	YD-213-K	For No. 3 cyl. (21" loom lenght)	1		4
386	YD-213-L	For No. 4 cyl. (30-1/2" loom length)	1		5
387	YD-89- J	**SHIELDED GROUND WIRE ASSEMBLY**	1		3
388	SA-74	**COVER** for ground switch box	1		1
389	YD-63	**BOX** for ground switch	1		2
390	YD-215	**INSULATOR** for switch box	1		1
392	YC-9-F-S1	**GROUND SWITCH ASSEMBLY** .... Includes: SD-109 Tag, PE-72 Washer. YC-9-C, replaced by YC-9-F-S1.	1		2
393	YL-191	**GROUND STRAP** for magneto	1		1
394	YL-352-23	**WIRE ASSEMBLY** (for remote ground) .. No. 52 (14 GA.) cable, 23" long, with terminals. On **MIL-E-11275-C** and **MIL-E-11275-B** engines.	1		1
396	YL-356-28	**STARTER CABLE**	1		4
		STANDARD HARDWARE			
		Except where hardness or plating is indicated, most of the following nuts, washers, capscrews and etc., are of a common variety.			
400	LK-9	**HOSE CLAMP,** 2-3/8" I.D. .... For air cleaner connection.	3		1
401	LK-24	**HOSE CLAMP,** 2-1/4" I.D. .... For elbow at carburetor.	1		1
403	PB-24	**SCREW,** 3/8"-24 S.A.E. thread x 1-1/8" long, hexagon head .... For mounting starting motor.	3		1
405	PD-10	**NUT,** 5/16"-24 thread, hexagon steel .. 2-for mounting oil filter pad cover. 2-for mounting starting motor bracket.	4		1
406	PD-11	**NUT,** 3/8"-24 thread, hexagon steel .... 1-for magneto stud (upper hole). 8-for connecting rod bolts.	9		1
407	PD-13	**NUT,** 1/2"-20 thread, hexagon steel .. For mounting cyl. block to crankcase.	12		1
408	PD-77	**NUT,** 1/4"-20 thread, hexagon steel .... 1-for governor adjusting screw pin. 2-for mounting starting switch.	3		1
409	PD-78	**NUT,** 5/16"-18 thread, hexagon steel.. 1-for spacer to gear cover (L.H. side). 4-for Military oil filter. 4-for air cleaner mounting.	9		1
410	PD-79	**NUT,** 3/8"- 16 thread, hexagon steel ... 1-for magneto screw (lower hole). 2-for muffler adapter flange.	3		1
412	PD-115-2	**NUT,** No. 10-32 thread, hex. steel plated For governor control rod and ball joints.	4		1
414	PD-207	**NUT,** 7/16"-20 thread, Seez-Proof, hexagon steel. For manifold to cyl. block ..	4		1
416	PE-3	**LOCKWASHER,** 1/4" Positive .... 2-for fuel pump adapter. 6-for crankcase splash plates. 8-for flywheel shroud screen. 32-for air shrouding. 2-for starting switch.	50		1
417	PE-4	**LOCKWASHER,** 5/16" Positive .... 14-for bottom cover. 15-for gear cover and spacer to case. 2-for mounting fuel pump. 2-for mounting carburetor. 6-for bearing plate (flywheel end). 4-for mounting governor housing. 2-for mounting starter support bracket. 2-for oil filter pad cover. 4-for Military oil filter. 4-for air cleaner mounting.	55		1

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

MODEL MVG4D PARTS LIST

Ref. No.	Part Number	Description	No. Req	Net Wt.	
				Lb	Oz
418	PE-5	**LOCKWASHER,** 3/8" Positive(11/16"OD) For mounting starter.	3		1
419	PE-5-A	**LOCKWASHER,** 3/8" Positive(9/16"O.D.) 6-for main bearing plate (take-off end). 2-for muffler adapter flange.	8		1
421	PE-7	**LOCKWASHER,** 1/2" Positive .... 12-for cylinder block to crankcase studs. 6-for mounting generator drive pulley.	18		1
422	PE-14	**LOCKWASHER,** No. 10 Positive .... For governor control rod ball joint.	2		1
423	PE-34-A	**LOCKWASHER,** ¼" External 'Everlock' plated .... 1-for mounting magneto ground strap. 4-for ignition cable clips.	5		1
424	PE-37	**LOCKWASHER,** 5/8" Positive .... For engine supports to crankcase.	4		1
425	PE-46	**LOCKWASHER,** 5/16" External Everlock For mounting camshaft gear.	3		1
426	PE-46-A	**LOCKWASHER,** 5/16" External Everlock Plated. 2-for mounting gear cover. 4-for mounting air shroud.	6		1
428	PE-56-A	**LOCKWASHER,** 3/8" External Everlock plated .... 2-for mounting magneto, upper and lower holes. 2-for mounting air shroud (center holes).	4		1
429	PE-76-A	**LOCKWASHER,** 3/8" I.E.T. Everlock, plated .... For magneto mounting screw.	1		1
430	PE-80	**LOCKWASHER,** 3/8" Internal Everlock For mounting ignition switch.	1		1
432	PF-18	**PIPE PLUG,** 1/8" slotted, steel .... 5-for taps in oil header tube. 1-for oil filter inlet hole (bottom of case) 1-for oil pump lockscrew. 1-for oil header.	8		1
433	PH-14	**PLAIN WASHER,** 5/16" copper .... 4-for valve inspection cover. 2-for spacer plate to crankcase (at idler gear). Not illustrated.	6		1
434	PH-22-A	**WASHER,** 3/8"I.D. x 11/16"O.D., plain steel, for mounting cylinder heads	34		1
435	PH-79-A	**WASHER,** 7/16" I.D. x 13/16"O.D. x 1/8" thick, plain steel .... For manifold to cylinder block.	4		1
436	PH-194	**WASHER,** 1/4" I.D. x 5/8" O.D., plain steel, for starter to support bracket......	1		1
437	PH-332	**WASHER,** 1/8"I.D. x 5/16"O.D. x 1/32" thick, plain steel (T-89-7 gov.) .... Between governor control rod and lever.	1		1
438	PL-24	**WOODRUFF KEY,** No. 29 .... For mounting flywheel.	1		1
439	PL-49	**WOODRUFF KEY,** No. 15 .... For crankshaft gear.	1		1
441	RF-794	**PIPE NIPPLE,** 1/8" x 3/4" long, iron For mounting fuel strainer.	1		1

Ref. No.	Part Number	Description	No. Req	Net Wt.	
				Lb	O
442	RF-996	**STREET ELL,** 1/8" x 90° .... For mounting fuel strainer.	1		1
443	SA-26	**PLUG,** 5/8" Expansion .... For camshaft oil hole.	2		1
444	SA-58	**PLUG,** 1-3/8" Expansion .... For camshaft end hole.	1		
446	XA-8	**SCREW,** No. 10-32 thread x 1/2" long, steel round head .... For mounting starter to bracket.	1		1
447	XA-33	**SCREW,** 1/4"-20 thread x 3/8" long, indented hex. head .... 8-for flywheel shroud screen. 30-for air shrouding. 1-for tap in cylinder block (R.H. side).	39		1
448	XA-34	**SCREW,** 1/4"-20 thread x 1/2" long, indented hex. head .... 2-for rear shroud covers — upper holes. 6-for crankcase splash plates.	8		1
449	XA-65	**SCREW,** No. 8 x 1/2" long, self-tapping. sheet metal, for mounting control panel.	4		1
451	XD-5	**SCREW,** 1/4"-20 thread x 5/8" long, hexagon head .... For mounting starter switch.	2		1
452	XD-6	**SCREW,** ¼"-20 thread x ¾" long, hexagon head .... For mounting fuel pump adapter.	2		1
453	XD-13-1	**SCREW,** 5/16"-18 thread x 1/2" long, 1/8" thick hexagon head (special) .... For mounting flywheel shroud to gear cover.	4		1
454	XD-14	**SCREW,** 5/16"-18 thread x 5/8" long, hexagon head .... 14-for crankcase bottom cover. 4-for mounting Military oil filter. 4-for air cleaner mounting.	22		
455	XD-15	**SCREW,** 5/16"-18 thread x 3/4" long, hexagon head .... 8-for mounting spacer to gear cover and crankcase. 2-for mounting fuel pump.	10		1
456	XD-16	**SCREW,** 5/16"-18 thread x 7/8" long, hexagon head .... For mounting governor housing.	4		1
457	XD-17	**SCREW,** 5/16"-18 thread x 1" long, hexagon head .... 6-for bearing retainer plate (flywheel end). 3-for mounting camshaft gear. 1-for spacer to gear cover. (Not illust.)	10		2
458	XD-19	**SCREW,** 5/16"-18 thread x 1-1/4" long, hexagon head .... For mounting gear cover.	10		2
460	XD-21	**SCREW,** 5/16"-18 thread x 1½" long, hexagon head .... For carburetor mounting.	2		2
461	XD-29	**SCREW,** 3/8"-16 thread x 1-1/4" long, hexagon head .... 6-for mounting main bearing plate — take-off end. 2-fpr muffler adapter flange.	8		2

IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

MODEL MVG4D PARTS LIST

Ref. No.	Part Number	Description	No. Req	Net Wt.	
				Lb	Oz
462	XD-30	**SCREW,** 3/8"-16 thread x 1-1/2" long, hexagon head (special hardness) .... For mounting cylinder heads.	34		2
463	XD-33	**SCREW,** 3/8"-16 thread x 2-1/4" long, hexagon head .... For mounting magneto (lower hole).	1		2
465	XD-42	**SCREW,** 1/2"-13 thread x 1-1/4" long, hexagon head .... For mounting generator drive sheave.	6		2
466	XD-52	**SCREW,** 5/8"-11 thread x 1-3/4" long, hexagon head .... For engine supports to crankcase.	4		2
467	XD-114-1	**SCREW,** 3/8"-16 thread x 1/2" long, hexagon head .... For mounting flywheel shroud to gear cover.	2		1
469	XD-148	**SCREW,** 5/16"-18 thread x 1-5/8" long, hexagon head .... For valve inspection cover.	4		2
470	XE-55	**SCREW,** 5/16"-18 thread x 3/8" long, Allen head set .... For mounting idler stud.	1		1
472	XI-32	**COTTER PIN,** 3/64 x 3/8" long .... For governor control rod. (MIL-E-11275-A)	1		1
474	XJ-58	**RIVET,** 1/8" dia. blind .... 4-for instruction plate mounting. 4-for Military identification plate. XA-67 self tapping screw, replaced by XJ-58, but No. 30 drill hole required.	8		1
475	XK-1	**PLUG,** 1/8", pipe, squarehead .... For inlet manifold.	1		1
476	XK-2	**PLUG,** 1/4", pipe squarehead .... For manifold, on MIL-E-11275-C and MIL-E-11275-B Spec engines.	2		1
477	XK-3	**PIPE PLUG,** 3/8" sq. head, in gear cover.. For power units and MIL-E-11275-A Spec engines.	1		2

IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

REPAIR PARTS LIST

FOR
POWER UNIT HOUSE PARTS
AND
ACCESSORIES COMMONLY SUPPLIED ON ENGINE

WISCONSIN
ENGINES

IMPORTANT

THE FOLLOWING SECTION IS INTENDED TO BE AN AID IN SELECTING SERVICE PARTS ONLY IF THEY HAD ORIGINALLY BEEN SUPPLIED WITH THE ENGINE.

SHOULD IT BE DESIRED TO CONVERT AN ENGINE TO USE ANY ACCESSORIES, CONTACT WISCONSIN MOTOR CORPORATION OR AN AUTHORIZED DEALER OR DISTRIBUTOR BEFORE ORDERING PARTS. IN MOST CASES, A CONVERSION CAN ONLY BE MADE IF MAJOR ENGINE PARTS ARE ALSO CHANGED.

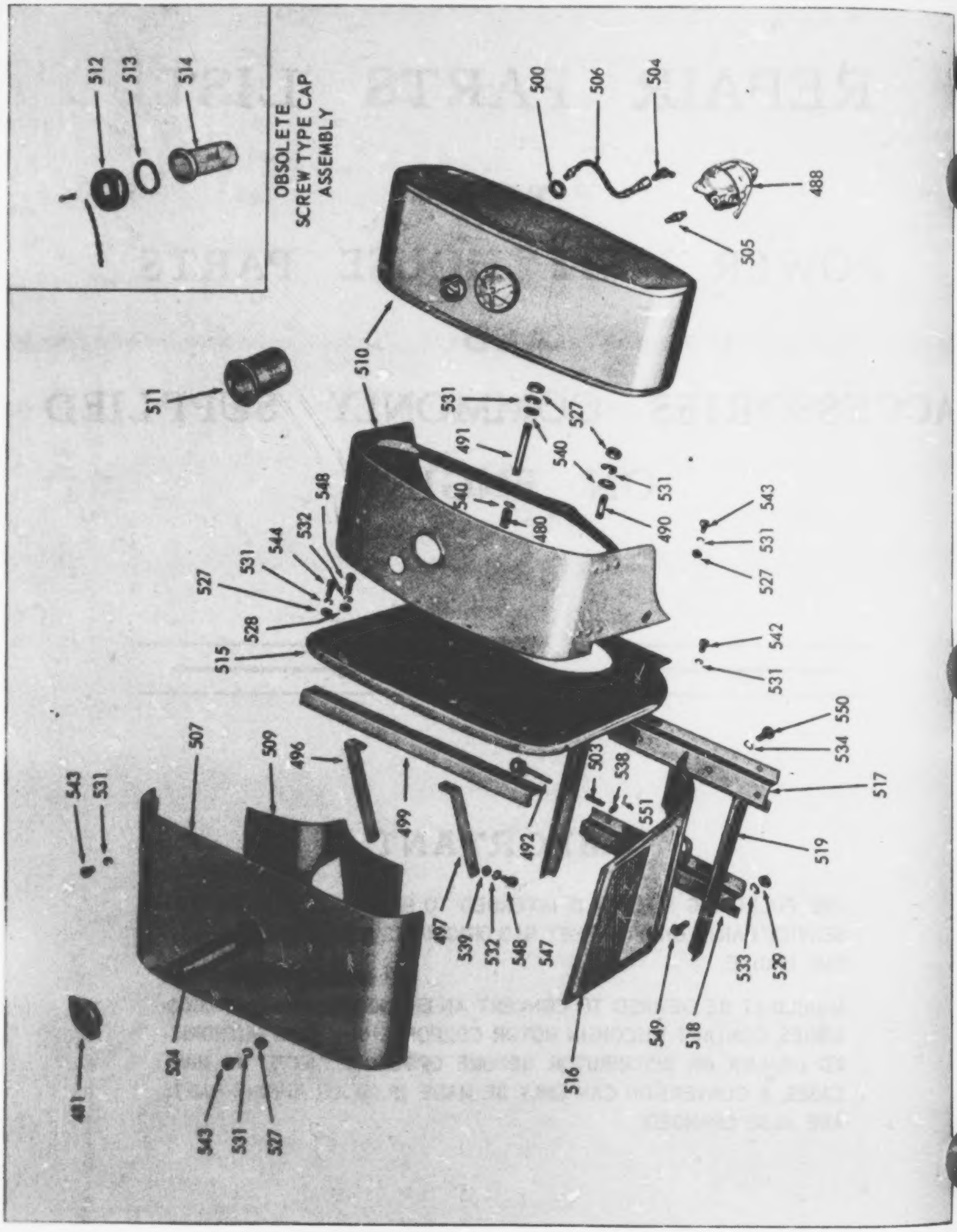

OBSOLETE SCREW TYPE CAP ASSEMBLY
512
513
514
500
506
504
488
505
510
511
531
527
491
540
531
540
480
490
543
531
527
548
532
544
531
527
528
515
542
531
550
534
517
507
509
496
499
492
503
538
551
519
543
531
481
524
543
531
527
497
539
532
548
547
516
549
518
533
529

Fig. 65, ENGINE HOUSE AND FUEL TANK GROUP

Parts are identified by reference number. See parts list for correct part number.

292208C

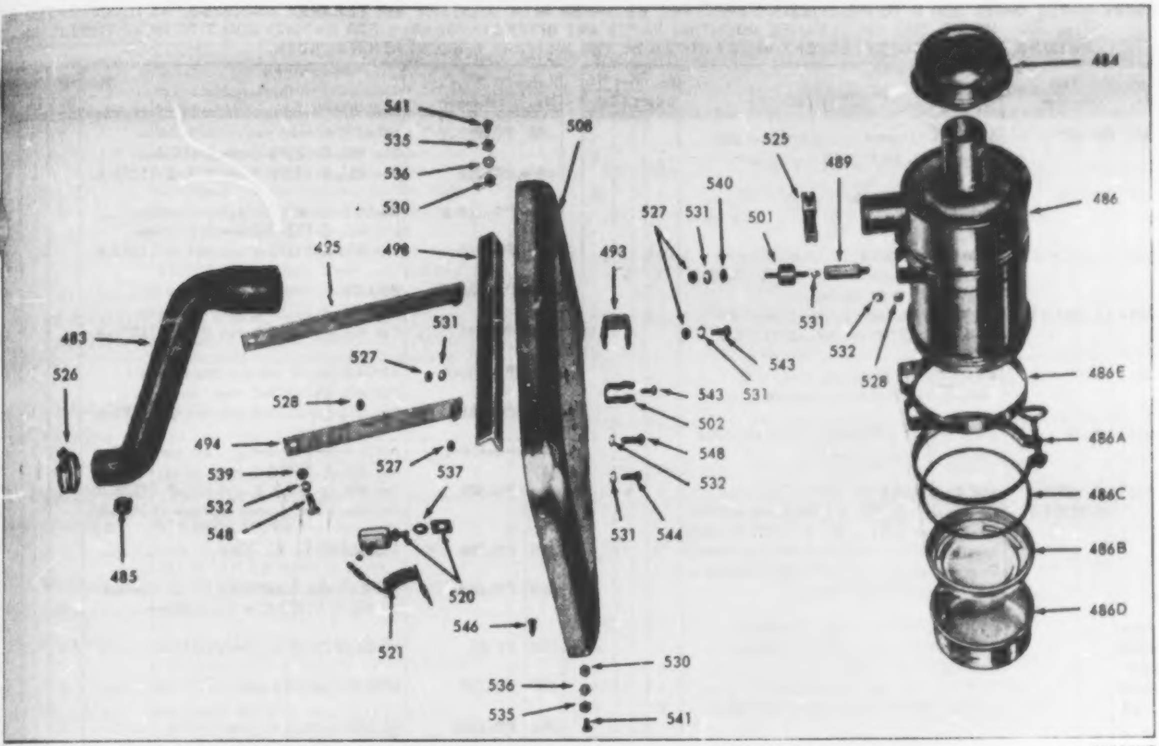

484
541
535
536
530
508
525
489
540
486
527
531
501
495
498
493
483
531
531
532
528
543
531
527
526
528
543
502
486E
494
527
537
548
486A
539
532
548
532
531
544
486C
486B
485
520
486D
546
521
530
536
535
541

Fig. 66, END PANEL AND MILITARY AIR CLEANER per MIL-E-11275-C specification

292209C

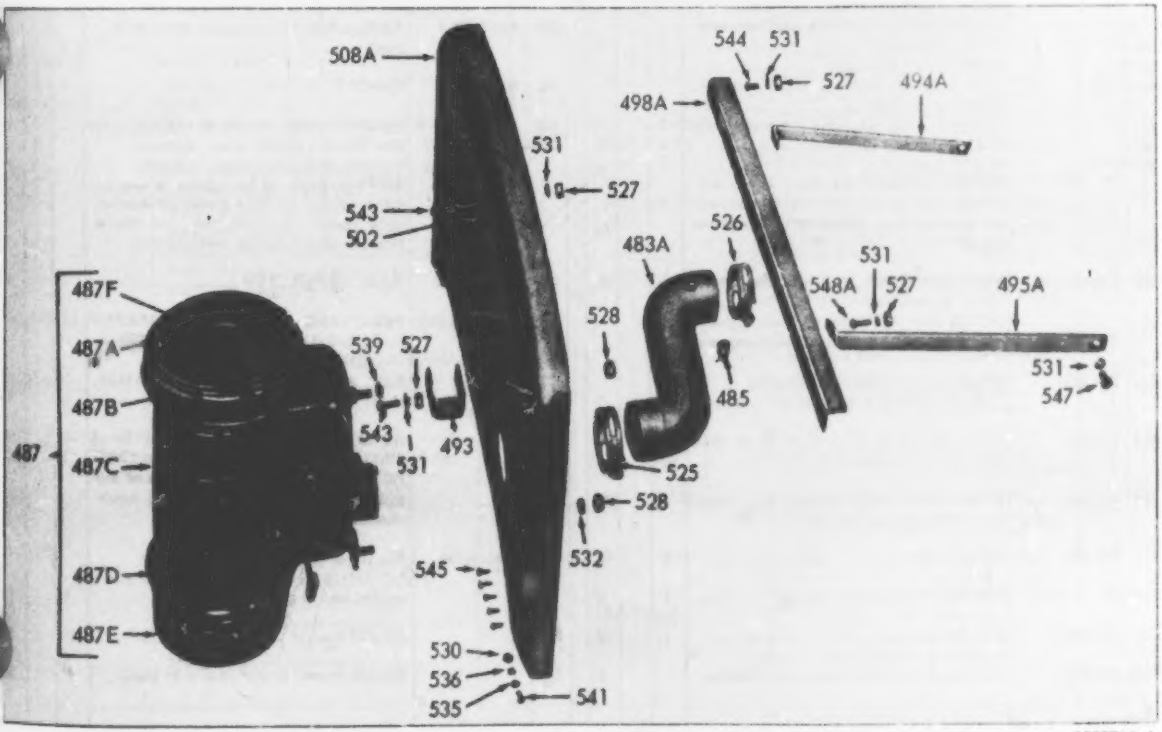

508A
544
531
527
494A
498A
531
527
543
502
526
483A
531
548A
527
495A
487F
487A
539
527
528
531
487B
543
531
493
485
547
487
487C
525
528
532
487D
545
487E
530
536
535
541

Fig. 67, END PANEL AND AIR CLEANER per MIL-E-11275-B and MIL-E-11275-A specifications

125976C-A

Parts are identified by reference number. See parts list for correct part number.

MODEL MVG4D POWER UNIT HOUSE PARTS

NOTE: POWER UNITS BUILT TO MIL-E-11275-C SPEC ARE EQUIPPED WITH MILITARY AIR CLEANER MS-35875-3, AS ILLUSTRATED IN *Fig. 66.* HOUSE AND AIR CLEANER MOUNTING PARTS ARE INTERCHANGEABLE FOR ENGINES BUILT TO MIL-E-11275-C, MIL-E-11275-B OR MIL-E-11275-A, EXCEPT WHERE NOTED BY THE MILITARY SPECIFICATION NUMBER.

Ref. No.	Part Number	Description	No. Req	Net Wt.	
				Lb	Oz
480	HF-397	**SPACER** between rear panel and cylinder block, L. H. side	1		1
481	LF-132	**FLANGED MUFFLER ADAPTER** (female). Refer to Fig. 51 for male half.	1		10
483	LL-162-51	**RUBBER ELBOW ASSEMBLY** for air cleaner connection. For **MIL-E-11275-C** Includes LO-88 drip plug.	1	1	
483A	LL-88A-51	**RUBBER ELBOW** for air cleaner per **MIL-E-11275-B** and **MIL-E-11275-A** ..			12
484	LO-62	**WEATHER CAP** for air cleaner on **MIL-E-11275-C** Spec engines	1	1	
485	LO-88	**DRIP PLUG ASSEMBLY** for carburetor In air cleaner connection.	1		1
486	LO-138-51 MS-35875-3	**AIR CLEANER** (6" dia.) Donaldson Co. No. **KAX00-0354** or-0405 for engines built to **MIL-E-11275-C** spec. Service parts: Donaldson part numbers. **Body assembly—not serviced separately, order complete air cleaner.**	1	6	
486A		**P10-1362** Oil cup clamp assembly	1		3
486B		**P10-1360** Oil cup assembly (inner)	1		6
486C		**P10-1361** Cup gasket	1		1
486D		**P-17703** Oil cup (outer)	1		10
486E		**AAH00-0343** Mounting band assembly	2		6
487	LO-89-51	**AIR CLEANER** (5-1/4" dia.) Comm. type Donaldson No. **FCA06-5210** per **MIL-E-11275-B** and **MIL-E-11275-A.** Service Parts: Donaldson part numbers.		7	8
487A		**P-2274** Wing nut	2		1
487B		**P-8730** Hood assembly	1		6
487C		**Body assembly — not serviced — order complete air cleaner**	1		
487D		**P-2706** Oil cup retaining clamp assembly	1		3
487E		**P-8733** Oil cup assembly	1		8
487F		**P-6921** Jam nut	1		1
		NOTE: LO-89-S1 is replaced by LO-160-S1, or use LO-138-S1 Military air cleaner and necessary conversion parts.			
488	LP-19	**FUEL STRAINER,** Tillotson OW-418-T With shut-off valve. **NOTE:** See illustration in back of manual for service parts list of fuel strainers	1		6
489	PC-564	**STUD** for air cleaner mounting on **MIL-E-11275-C** Spec engines	4		3
490	PC-565	**STUD** for rear panel to block (R.H. side) XD-7 screw, replaced by PC-565.	1		2
491	PC-566	**STUD** for rear panel to block (L.H. side) XD-145 screw, replaced by PC-566.	1		3
492	PG-323	**DOOR CLIP**	2		3
493	PG-491	**BRACKET** for starting crank	1		2
494	PG-521-A	**BRACE** to front panel, L. H. side ...... For **MIL-E-11275-C** spec. engines.	1		12
494A	PG-521	For **MIL-E-11275-B** and **MIL-E-11275-A.**			5
495	PG-522-A	**BRACE** to front panel, R. H. side .... For **MIL-E-11275-C** spec. engines.	1	1	
495A	PG-522	For **MIL-E-11275-B** and **MIL-E-11275-A.**			6
496	PG-523-A	**BRACE** to rear panel, L. H. side .... For **MIL-E-11275-C** spec. engines.	1		1
	PG-523	For **MIL-E-11275-B** and **MIL-E-11275-A.**			5
497	PG-524-A	**BRACE** to rear panel, R. H. side .... For **MIL-E-11275-C** spec. engines.	1		8
	PG-524	For **MIL-E-11275-B** and **MIL-E-11275-A.**			4
498	PG-525-A	**ANGLE** for reinforcing front panel .... For **MIL-E-11275-C** spec. engines.	1	1	6
498A	PG-525	For **MIL-E-11275-B** and **MIL-E-11275-A.**		1	6
499	PG-526-1	**ANGLE** for reinforcing rear panel .... For **MIL-E-11275-C** spec. engines.	1	1	7
	PG-526	For **MIL-E-11275-B** and **MIL-E-11275-A.** PG-526-1 can be used in place of PG-526.		1	7
500	PH-198	**GROMMET** for fuel line	1		1
501	PH-542	**VIBRATION DAMPNER** for air cleaner on **MIL-E-11275-C** spec. engines	4		3
502	PK-87	**SPRING CLIP** for crank mounting	1		1
503	PM-137	**SPRING** for door clip	2		1
504	RF-1225	**ELBOW** in fuel strainer outlet	1		1
505	RM-1280	**STAND PIPE ASSEMBLY** for fuel tank	1		2
506	RM-1319-J	**FUEL LINE,** 4" long, fuel strainer to pump	1		2
507	WE-247-AT	**CANOPY**	1	6	
508	WE-248F-1-T	**FRONT PANEL** for **MIL-E-11275-C** spec.	1	6	4
508A	WE-248-33-T	For **MIL-E-11275-B** spec. engines.		6	4
	WE-248-12-T	For **MIL-E-11275-A** spec. engines.		6	8
		NOTE: Because of the numerous special front panels for this model of engine, give Model, Specification and Serial Number when ordering replacement.			
509	WE-249-AT	**HEAT DEFLECTOR**	1	1	4
510	WE-250-ET-S1	**FUEL TANK** and **SUPPORT ASSEMBLY** For **MIL-E-11275-C** and **MIL-E-11275-B.** Includes:	1	23	
		CAP, AC Spark Plug Co. No. RC-15634, sheet metal "Easy-on" type	1		4
511		**RD-132-B** screen (3-3/16 dia. x 4½" long)	1		3
		STAND PIPE, Wis. Motor No. RM-1280	1		2
		NOTE: The above tank cap replaced the following cap set-up, but is not interchangeable.			
512	(Obsolete)	**RC-109-S1** Cap Assembly (brass, 3-7/16"-16 thread, screw-on type) with gasket and chain	1		8
513		**QD-728** Gasket	1		1
514		**RD-132** Screen 2-3/4" dia. x 5" long) ..	1		3

IMPORTANT: Always give Model, Specificatio [illegible] rial Numbers as shown on name plate.

MODEL MVG4D POWER UNIT HOUSE PARTS

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
	WE-250-BT-S1	**FUEL TANK** and **SUPPORT** with **RC-104-S1** Cap Assembly for **MIL-E-11275-A** spec. engines .... (2"-18 thread, brass screw-on cap). Includes: QD-694 Gasket, RG-34 Vent Assembly, RD-127 Screen, Chain and Mounting Clips. For complete replacement, use **WE-250-ET-S1** Fuel Tank Assembly which includes fuel gauge.	1	17	4
515	WE-251A-33-T WE-251A-17-T	**REAR PANEL** for **MIL-E-11275-C** spec. For **MIL-E-11275-B** and **MIL-E-11275-A**. WE-251A-33-T can be used in place of WE-251A-17-T.	1	11	8
516	WE-252-T	**DOOR**	2	6	
517	WE-253-A	**ENGINE SUPPORT** – take-off end ...... (1-5/8" high). For **MIL-E-11275-C** and **MIL-E-11275-B** spec. engines.	1	4	5
	WE-253	1-1/2" high, for **MIL-E-11275-A** engines		3	12
518	WE-254-A	**ENGINE SUPPORT** – flywheel end ..... (1-5/8" high). For **MIL-E-11275-C** and **MIL-E-11275-B** spec. engines.	1	3	12
	WE-254	(1-1/2" high). For **MIL-E-11275-A** engines		3	
519	WE-255	**SIDE RAIL**	2	1	4
520	YC-9-F-S1	**GROUND SWITCH ASSEMBLY** .... Includes: SD-109 Tag, PE-72 Lockwasher. YC-9-C, replaced by YC-9-F-S1.	1		2
521	YL-352-23	**GROUND WIRE** for **MIL-E-11275-C** and **MIL-E-11275-B** spec. engines	1		1
		STANDARD HARDWARE			
524	LJ-337	**PIPE NIPPLE**, 1-1/2" x 9-1/4" long .. For mounting exhaust muffler.	1	2	
525	LK-9	**HOSE CLAMP**, 2-3/8" I.D. .... For air cleaner connection, cleaner end.	1		1
526	LK-24	**HOSE CLAMP**, 2-1/4" I.D. .... For air cleaner connection, carburetor end.	1		1
527	PD-77	**NUT**, 1/4"-20 thread, hexagon steel .. 5-for reinforcing angles. 7-for fuel tank support to rear panel. 4-for heat deflector to canopy. 3-for mounting crank support and clip. 4-for vibration dampner mounting. 2-for rear panel studs.	25		1
528	PD-78	**NUT**, 5/16"-18 thread, hexagon steel.. 4-for mounting air cleaner. 4-for braces to rear and front panels.	8		1
529	PD-79	**NUT**, 3/8"-16 thread, hexagon steel .... For side rails to engine supports.	4		1
530	PD-115	**NUT**, No. 10-32 thread, hexagon steel For front panel to side and top of flywheel shroud.	4		1
531	PE-3	**LOCKWASHER**, 1/4" Positive .... 14-for canopy. 5-for reinforcing angles. 8-for tank support to rear panel. 5-for rear panel to engine support. 4-for heat deflector to canopy. 3-for mounting crank support and clip. 2-for rear panel studs. 8-for vibration dampner mounting.	49		1
532	PE-4	**LOCKWASHER**, 5/16" Positive .... 4-for mounting air cleaner. 6-for mounting house braces.	10		1
533	PE-5	**LOCKWASHER**, 3/8" Positive .... For side rails to engine supports.	4		1
534	PE-37	**LOCKWASHER**, 5/8" Positive .... For engine supports to crankcase.	4		1
535	PE-45	**LOCKWASHER**, No. 10 External 'Everlock' .... For front panel to flywheel shroud.	4		1
536	PE-78-A	**LOCKWASHER**, No. 10 internal-external 'Everlock' between panel and flywheel shroud	4		1
537	PE-80-A	**LOCKWASHER**, 3/8" internal 'Everlock' For ground switch.	1		1
538	PH-2	**PLAIN WASHER**, 7/16" I.D. x 1/16" thick steel, for door clip	2		1
539	PH-77	**PLAIN WASHER**, 5/16" I.D. x 1/16" thick steel .... 1-for air cleaner support screw. 2-for house braces to manifold.	3		1
540	PH-196	**PLAIN WASHER**, 1/4" I.D. x 1/16" thick, steel... 3-for rear panel studs. 2-for vibration dampner (lower holes).	5		1
541	XA-8	**SCREW**, No. 10-32 thread x ½" long, round head .... For front panel to flywheel shroud.	4		1
542	XA-33	**SCREW**, ¼"-20 thread x 3/8" long, round head or indented hexagon head .. For rear panel to engine support.	5		1
543	XA-34	**SCREW**, ¼"-20 thread x ½" long, round head or indented hexagon head .... 8-for fuel tank support. 14-for canopy and tank support. 4-for heat deflector. 3-for starter crank support.	29		1
544	XA-35	**SCREW**, 1/4"-20 thread x 5/8" long, round head or indented hexagon head .. For mounting reinforcing angles.	5		1
545	XA-65	**SCREW**, No. 8 x ½" long, self tapping, sheet metal... For front panel (MIL-E-11275-B and -A)	5		1
546	XA-105	**SCREW**, No. 14 x 5/8" long, self tapping, sheet metal.. For front panel to shroud. (MIL-E-11275-C)	3		1
547	XD-4	**SCREW**, ¼"-20 thread x ½" long, hexagon head. (MIL-E-11275-B, MIL-E-11275-A) For house braces to manifold.	2		1
548	XD-15	**SCREW**, 5/16"-18 thread x ¾" long, hex. 4-for mounting house braces to front and rear panels. 2-for house braces to manifold (MIL-E-11275-C spec. engines)	6		1
548A	XA-36	**SCREW**, 1/4"-20 thread x 3/4" long, round head or indented hexagon head .. For mt'g. house braces. (MIL-E-11275-B)	4		1
549	XD-25	**SCREW**, 3/8"-16 thread x 3/4" long, hexagon head .... For side rails to engine supports.	4		1
550	XD-51	**SCREW**, 5/8"-11 thread x 1-1/4" long, hexagon head .... For mounting engine supports to case.	4		2
551	XI-23	**COTTER PIN**, 1/8" x 3/4" long .... For door clips.	2		1

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

MILITARY OIL FILTER MOUNTING FOR MODEL MVG4D POWER UNIT

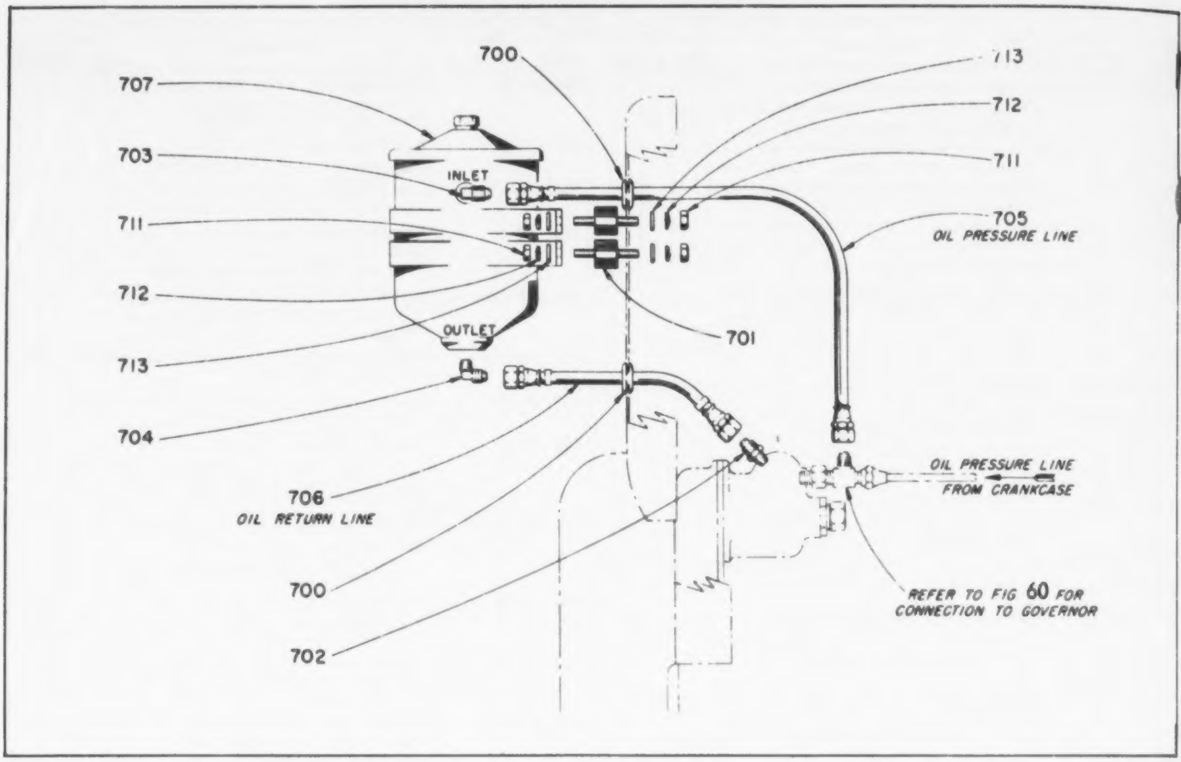

700
713
707
712
703
INLET
711
705
OIL PRESSURE LINE
711
712
OUTLET
701
713
704
OIL PRESSURE LINE FROM CRANKCASE
706
OIL RETURN LINE
700
REFER TO FIG 60 FOR CONNECTION TO GOVERNOR
702

Fig. 68

Ref. No.	Part Number	Description	No. Req	Net Wt.	
				Lb	Oz
700	PH-198	**GROMMET** for oil lines, in power unit house panel	2		1
701	PH-542	**VIBRATION DAMPNER** for oil filter on **MIL-E-11275-C** Spec engines	4		3
702	RF-1359	**45° ELBOW FITTING** in governor housing for oil return line RF-269 straight fitting, repl'd. by RF-1359.	1		1
703	RF-270-4	**RESTRICTED ELBOW** in oil filter inlet (top hole)	1		1
704	RF-1225	**ELBOW** in bottom of oil filter for oil return line	1		1
705	RM-1320-C	**FLEXIBLE LINE,** oil pressure, 22-3/4" long on **MIL-E-11275-C** Spec engines	1		6
		RM-477 ¼" tubing with nuts, 18" long, for **MIL-E-11275-B** Spec	1		4
706	RM-1320-G	**FLEXIBLE LINE,** oil return, 16-1/4" long on **MIL-E-11275-C** Spec engines	1		4
		RM-921 ¼" tubing with nuts, 14-1/2" long, for **MIL-E-11275-B** Spec	1		4
707	RV-28	**OIL FILTER, FRAM No. F-21-P** See exploded view and parts list on following page for service parts and instructions.	1	6	

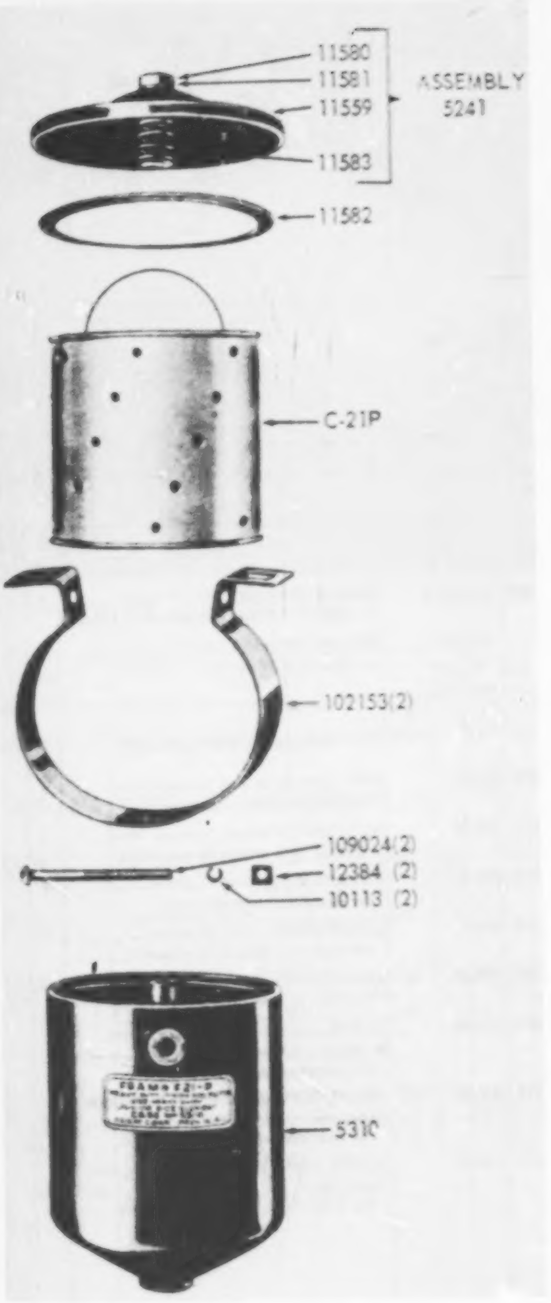
Ref. No.	Part Number	Description	No. Req	Net Wt.	
				Lb	Oz
		STANDARD HARDWARE			
711	PD-77	**NUT,** 1/4"-20 thread, hexagon steel For mounting oil filter to house panel.	8		1
712	PE-3	**LOCKWASHER,** 1/4" Positive For mounting oil filter to house panel.	8		1
713	PH-196	**PLAIN WASHER,** 1/4" I.D. x 5/8" O.D. x 1/16" thick, steel For mounting oil filter to house panel.	8		1
	XD-5	**SCREW,** 1/4"-20 thread x 5/8" long, hexagon head (not illustrated) For mounting oil filter to house panel on **MIL-E-11275-B** Spec engines.	4		1

IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

PARTS LIST FOR FRAM MILITARY TYPE OIL FILTER

WISCONSIN MOTOR PART NO. RV-28
FRAM CORP. PART NO. F21-P

FRAM CORPORATION – PROVIDENCE 16, RHODE ISLAND



194535C-A1

All numbers shown are FRAM part numbers

PARTS

11580 – Cap Screw)
11581 – Cap Screw Gasket) Assembly
11559 – Cover) 5241
11583 – Cover Spring)
11582 – Cover Gasket
C-21P – Cartridge
102153 – Strap (2)
109024 – Bolt (2)
12384 – Nut (2)
10113 – Lock Washer (2)
5310 – Filter Body Assembly

From F21-P Oil Filter

Ordnance Part No. 540-501

Ordnance Stock No. H 016-054-0501

Conforms To Federal Spec. F-F-351 For Type I, Class 2, Heavy Duty Junior Size

SERVICE INSTRUCTIONS

1. Remove Cover
2. Remove Cartridge,
   Clean Out Sludge
   Note: Do not remove 11562 spacer from center tube
3. Install New C-21P Cartridge
4. Install New Cover Gasket 11582
5. Reinstall Cover
6. Add Oil to Compensate For Filter
7. Run Engine For Five Minutes and Check For Leaks
8. Recheck Oil Level

Refer to engine specification or end product specification for correct mounting parts and oil lines, as this filter may be mounted in various locations on the engine or unit.

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

SIDE MOUNT FUEL TANK MOUNTING
FOR MODEL MVG4D

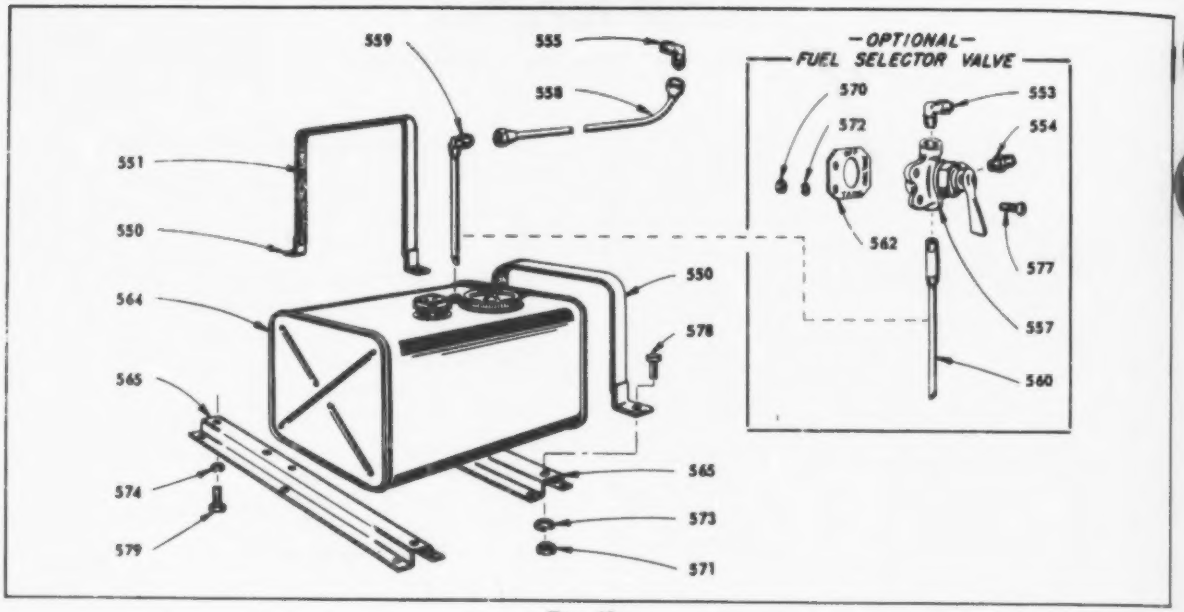


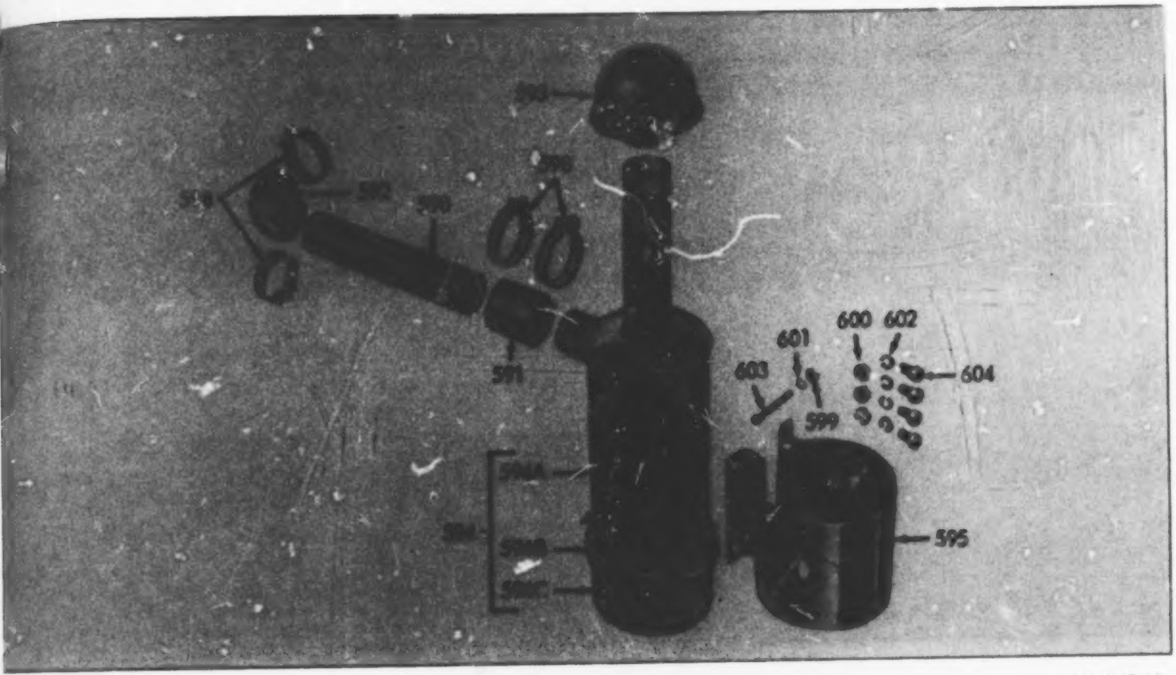
Fig. 69

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
550	PG-455	**STRAP** for fuel tank	2	1	1
551	PH-244-A	**FELT** for fuel tank strap	2		2
553	RF-171	**ELBOW,** in selector valve, for fuel line connection from auxiliary tank	1		2
554	RF-269	**STRAIGHT FITTING,** in selector valve For fuel line to fuel strainer.	1		1
555	RF-1225	**ELBOW,** in fuel strainer inlet	1		1
557	RG-36-A	**FUEL SELECTOR VALVE**	1		6
558	RM-524	**FUEL LINE,** tank or selector valve to strainer, ½" tubing, 31" long, with nuts	1		3
559	RM-1206-A	**SUCTION TUBE** with elbow	1		3
560	RM-1206-AA	**SUCTION TUBE** with pipe nipple .... (Used with selector valve).	1		3
562	SD-154-B	**INDICATOR TAG** for selector valve	1		1
564	WE-278-D-S1	**FUEL TANK,** 9 gal. capacity .... For **MIL-E-11275-C** and **MIL-E-11275-B.** Includes:	1	12	
		CAP, AC Spark Plug Co. No. RC-15834, sheet metal 'Easy-on' type	1		8
		SCREEN, Wis. Motor No. RD-132-B	1		2
		TUBE, Wis. Motor No. RM-1206-A........	1		2
		NOTE: The above tank cap replaces the following cap set-up and is not interchangeable.			
		RC-109-S1 Cap Assembly (brass, 3-7/16"-16 thread). Includes: QD-728 Gasket, RD-132 Screen and Chain			6
	WE-278A-S1	**TANK ASSEMBLY** for **MIL-E-11275-A** Spec engines. Includes:		11	3
		RM-1206-AA Suction tube			3
		RC-104-S1 Cap assembly, (2"-18 thread brass screw-on cap)			4
		Includes:			
		RD-127 Screen			
		RG-34 Air vent assembly			
		For complete replacement, use WE-278D-S1 Fuel Tank Assembly which includes fuel gauge.			

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
565	WE-281-B	**ENGINE SUPPORT** (1-5/8" high) ...... For **MIL-E-11275-C** and **MIL-E-11275-B.**	2	9	
	WE-281	**ENGINE SUPPORT** (1-1/2" high) ...... For **MIL-E-11275-A** Spec. engines.		8	8
		STANDARD HARDWARE			
570	PD-77	**NUT,** 1/4"-20 thread, hexagon steel.... For mounting indicator tag.	2		1
571	PD-79	**NUT,** 3/8"-16 thread, hexagon steel.... For fuel tank straps to supports.	4		1
572	PE-3	**LOCKWASHER,** 1/4" Positive .... For mounting indicator tag.	2		1
573	PE-5	**LOCKWASHER,** 3/8" Positive .... For fuel tank straps to supports.	4		1
574	PE-37	**LOCKWASHER,** 5/8" Positive .... For engine supports to crankcase.	4		1
577	XA-35	**SCREW,** 1/4"-20 thread x 5/8" long, indented hexagon head .... For mounting indicator tag.	2		1
578	XD-27	**SCREW,** 3/8"-16 thread x 1" long, hexagon head .... For fuel tank straps to supports.	4		1
579	XD-51	**SCREW,** 5/8"-11 thread x 1" long, hexagon head .... For engine supports to crankcase.	4		2

SIDE MOUNT AIR CLEANER
FOR MVG4D ENGINE PER MIL-E-11275-B AND MIL-E-11275-A SPECIFICATIONS

(REFER TO FIG. 57 FOR AIR CLEANER MOUNTING ON MIL-E-11275-C SPECIFICATIONS)



125975C-1A

Fig. 70

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
590	LJ-131	**TUBE** for air cleaner to carburetor elbow	1	1	8
591	LL-18	**RUBBER HOSE** for air cleaner tube	1		2
592	LL-89	**RUBBER ELBOW** for air cleaner tube	1		6
593	LO-62	**AIR STACK CAP**	1	1	
594	LO-90	**AIR CLEANER,** (5-1/4" dia.) obsolete Donaldson No. FCA05-5200 or A552.	1	5	
594A		– – – – Body assembly—not serviced— Order complete air cleaner.			
594B		**P-2706** Oil cup clamp assembly.........	1		3
594C		**P-8723** Oil cup assembly.....................	1		8
		For replacement of LO-90 use **LO-159-S1** (FGA05-2521)		5	
		Service parts for LO-159-S1:			
		P-17244 Oil cup (outer)	1		5
		P-17242 Oil cup (inner)	1		3
		P-2706 Oil cup clamp assembly	1		3

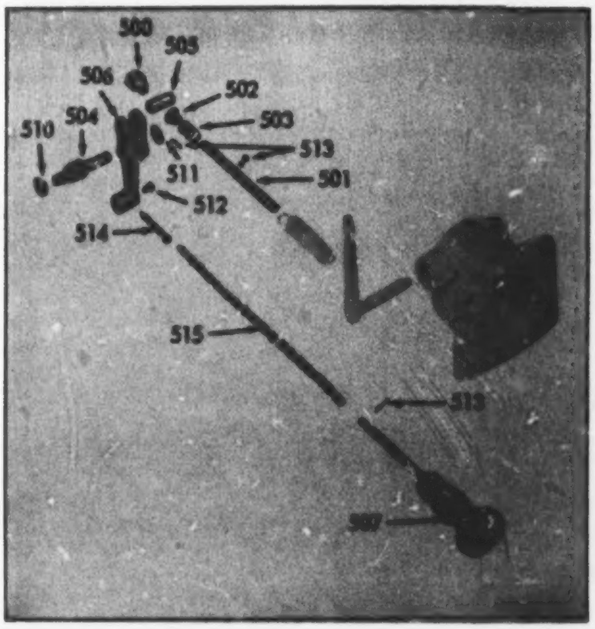
Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
		STANDARD HARDWARE			
598	LK-9	**HOSE CLAMP,** 2-3/8" I.D. .... For air cleaner connections.	3		1
	LK-24	**HOSE CLAMP,** 2-1/4" I.D., at carburetor end	1		1
599	PD-77	**NUT,** 1/4"-20 thread, hexagon steel.... For air cleaner strap clamping screws.	3		1
600	PD-78	**NUT,** 5/16"-18 thread, hexagon steel .. For air cleaner strap mounting.	3		1
601	PE-3	**LOCKWASHER,** 1/4" Positive .... For air cleaner strap clamping screws.	3		1
602	PE-4	**LOCKWASHER,** 5/16" Positive .... For air cleaner strap mounting.	4		1
603	XA-85	**SCREW,** 1/4"-20 thread x 2-1/2" long, round head .... For air cleaner strap clamping.	3		1
604	XD-14	**SCREW,** 5/16"-18 thread x 5/8" long, hexagon head .... For air cleaner strap mounting.	4		1

IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

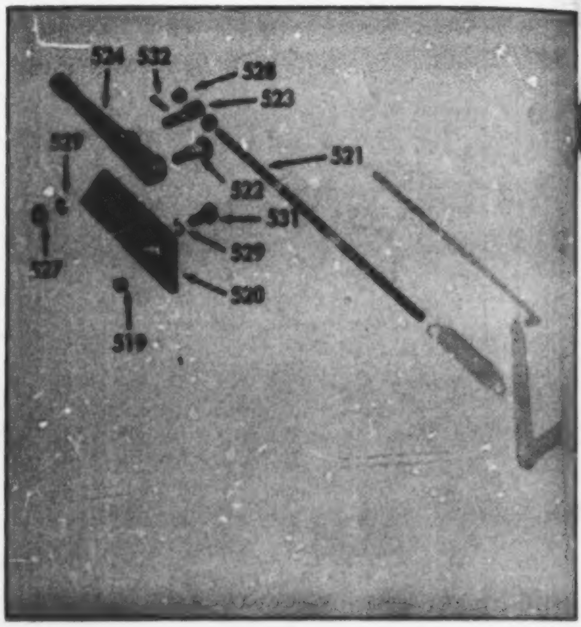
TT-61-C-1 VARIABLE SPEED GOVERNOR CONTROL ASSEMBLY

TT-61-D TWO SPEED GOVERNOR CONTROL ASSEMBLY

FOR MODEL MVG4D ENGINE



104568C-A



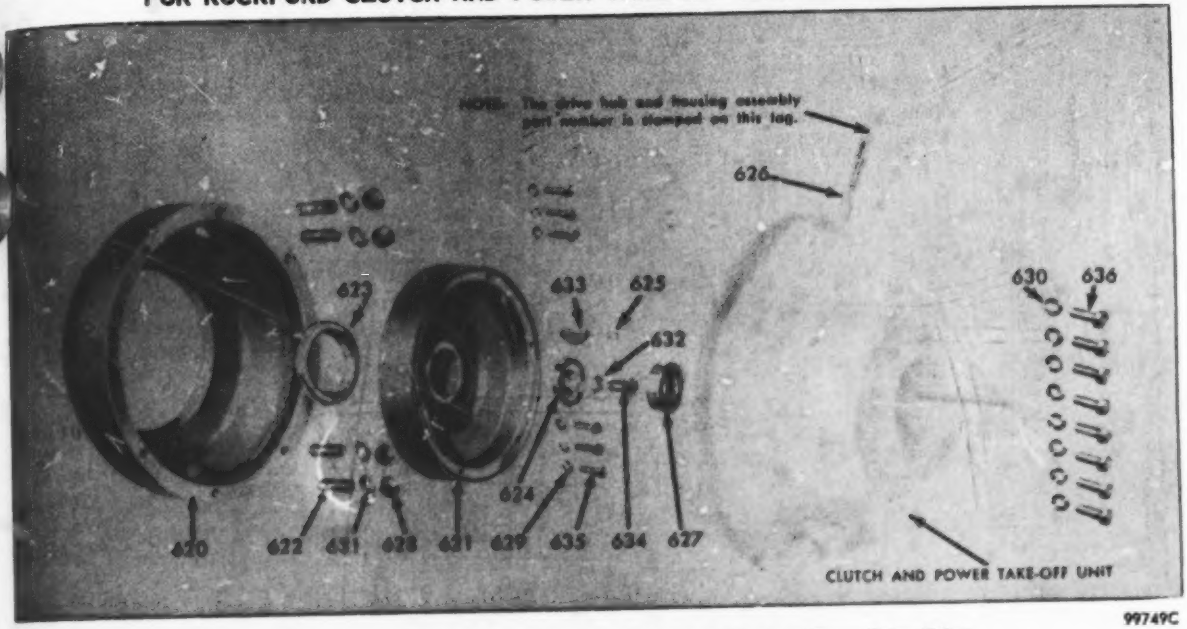
135518C-1

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
500	PD-173-A	**LOCKNUT** for adjusting screw	1		1
501	PI-145-1	**ADJUSTING SCREW**, 6-3/4" long	1		2
502	PK-121	**RETAINER** for adjusting screw spring	1		1
503	PM-111	**SPRING** for adjusting screw	1		1
504	TC-365-D	**PIN** for variable speed lever support	1		1
505	TC-368-A	**PIN** for adjusting screw swivel	1		1
506	VB-134-A	**VARIABLE SPEED LEVER**	1		4
507	VE-527-W	**CONTROL**	1		8
		STANDARD HARDWARE			
510	PE-3	**LOCKWASHER**, ¼" Positive For support pin.	1		1
511	PH-77	**PLAIN WASHER**, 5/16" I.D. x 5/8" O.D. x 1/16" thick steel For variable speed lever.	1		1
512	XA-62	**SCREW**, 8-32 thread x ¼" long, round head For cotter pin in lever.	1		1
513	XI-1	**COTTER PIN**, 1/16" x 1/2" long 1-for variable speed lever pin. 1-for adjusting screw spring. 1-for chain at control.	3		1
514	XI-11	**COTTER PIN**, 3/32" x 1¼" long For chain at lever.	1		1
515		**No. 1/0 GALVANIZED SAFETY CHAIN** 12" long. For control to lever.	1 pc		2

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
519	HF-417	**SPACER** for control bracket	1		1
520	PG-466	**BRACKET** for control lever	1		2
521	PI-147-B	**ADJUSTING SCREW**, 10½" long	1		2
522	TC-380	**FULCRUM PIN** for control lever	1		1
523	TC-381-1	**PIN** for adjusting screw	1		1
524	VB-142	**CONTROL LEVER**	1		4
		STANDARD HARDWARE			
527	PD-77	**NUT**, 1/4"-20 thread, hexagon steel For fulcrum pin.	1		1
528	PD-115	**NUT**, No. 10-32 thread, hexagon steel For adjusting screw.	2		1
529	PE-3	**LOCKWASHER**, 1/4" Positive 1-for fulcrum pin. 1-for bracket mounting.	2		1
531	XD-6	**SCREW**, 1/4"-20 thread x 3/4" long, hexagon head For bracket mounting.	1		1
532	XI-1	**COTTER PIN**, 1/16" x 1/2" long For adjusting screw pin.	1		1

IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

WW-83 CLUTCH DRIVE HUB AND HOUSING ASSEMBLY FOR ROCKFORD CLUTCH AND POWER TAKE-OFF UNIT ON MVG4D ENGINE


NOTE: The drive hub and housing assembly part number is stamped on this tag.
626
623
633
625
632
630
636
620
622
631
628
621
629
624
635
634
627
CLUTCH AND POWER TAKE-OFF UNIT

99749C

The Above Assembly is Suitable for Mounting the Following Clutch and Power Take-off Unit

WISCONSIN MOTOR Part Number	ROCKFORD Part Number	NET WEIGHT		NOTE: See Rockford illustration and parts list of Clutch and Power Take-off Parts.
		lbs	oz	
WC-302-B	PTA-5822	55		

NOTE: Engines equipped e ith a Clutch and Power Take-off Unit require a special main bearing plate, crankshaft and crankcase as follows:

BG-194-B-S1 **MAIN BEARING PLATE ASSEMBLY** (not illustrated)
Consisting of:
1 BG-194-B Bearing Plate
1 PH-278 Oil Seal

CA-69-E-2-S1 **CRANKSHAFT ASSEMBLY** (not illustrated) Includes:

1 GA-35A-1 Gear	1 PL-49 Key.
2 ME-98 Bearings	1 RK-173 Oil Slinger

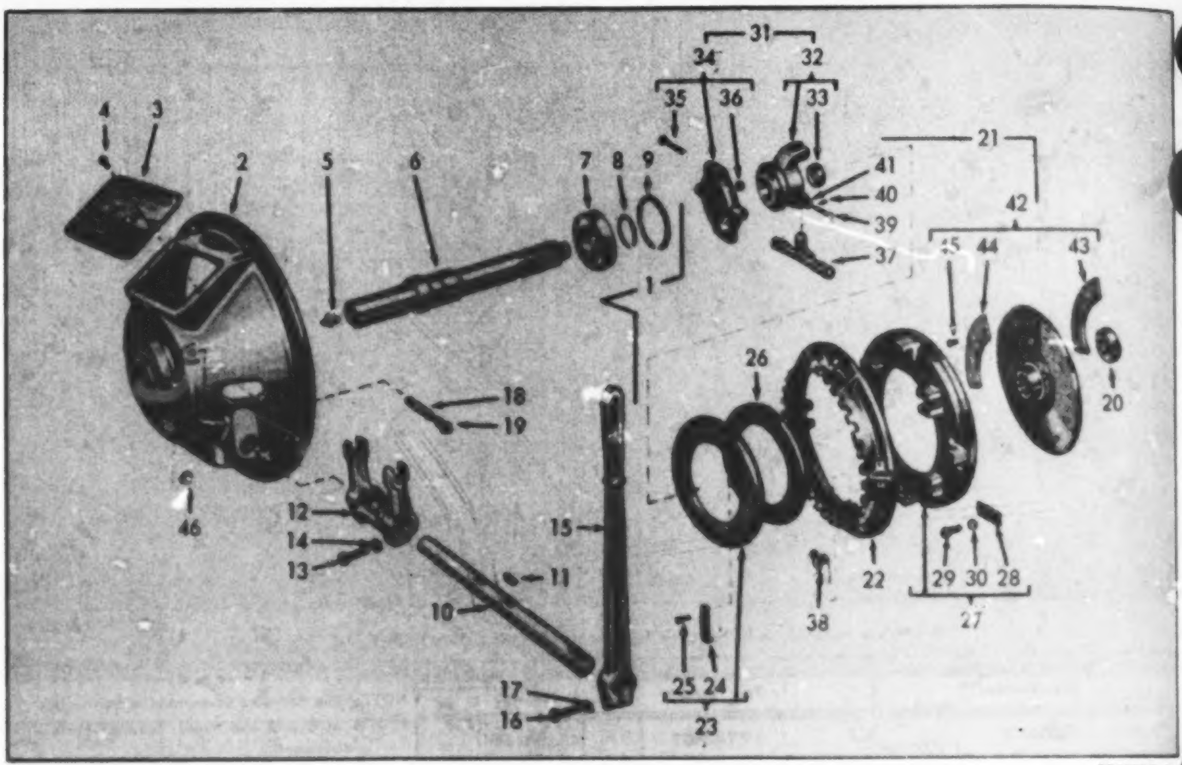
CA-69-D-2-S1 on Mil-E-11275-B and -A spec engines. – For replacement use CA-69-E-2-S1.

. **THE PART NUMBER OF THE CRANKCASE CAN BE FOUND STAMPED ON THE TAKE-OFF END OF THE CRANKCASE ABOVE THE MAIN BEARING PLATE.**

Ref. No.	Part Number	Description	No. Req	Net Wt.	
				Lb	Oz
	WW-83	**DRIVE HUB** and **HOUSING ASSEMBLY**. Consisting of the following parts:		50	
620	**BO-169B-2**	**HOUSING** for drive hub (No. 5 S.A.E.) ..	1	29	8
621	**HC-149**	**DRIVE HUB**	1	18	
622	**PC-287**	**STUD** for housing to crankcase mounting	4		2
623	**PH-278**	**SEAL** for main bearing	1		3
624	**PH-279**	**RETAINER** for drive hub	1		3
625	**QD-678**	**CORK SEAL** for drive key hub	1		1
626	**SD-79-B**	**ASSEMBLY NUMBER TAG**	1		1
627	**ME-190**	**PILOT BEARING** (Furnished with clutch)	1		8
		STANDARD HARDWARE			
628	**PD-15**	**NUT**, 5/8"-18 thread, hexagon steel ..... For mounting housing to crankcase.	4		1
629	**PE-4**	**LOCKWASHER**, 5/16" Positive .... For mounting clutch to drive hub.	6		1
630	**PE-5**	**LOCKWASHER**, 3/8" Positive .... For mounting unit to housing.	8		1
631	**PE-37**	**LOCKWASHER**, 5/8" Positive .... For mounting housing to crankcase.	4		1
632	**PE-50**	**LOCKWASHER**, 7/16" countersunk ...... For mounting hub retainer.	1		1
633	**PL-122-1**	**KEY**, No. 25 Woodruff .... For mounting drive hub.	1		1
634	**XC-22**	**SCREW**, 7/16"-14 thread x 1-1/4" long, flat head. For mounting hub retainer	1		1
635	**XD-17**	**SCREW**, 5/16"-16 thread x 1" long, hexagon head .... For mounting clutch to drive hub.	6		1
636	**XD-27**	**SCREW**, 3/8"-16 thread x 1" long, hexagon head .... For mounting unit to housing.	8		1

IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

WC-302-B CLUTCH AND POWER TAKE-OFF UNIT, ROCKFORD No. PTA-5822

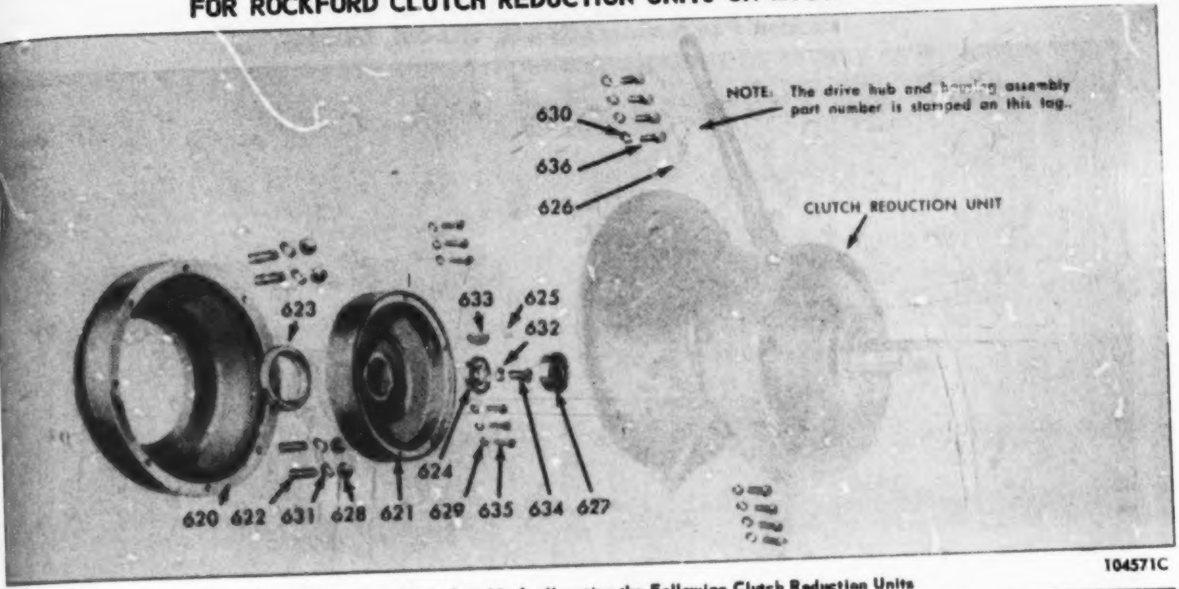


206585C-A

Ref. No.	Rockford Part Number	Description	No Req
1	PTA-5M30	**HOUSING** and **SHAFT ASSEMBLY**	1
		Consisting of:	
2	PT-969-28	**No. 5 S.A.E. HOUSING** (Rep'l. PT-969)	1
3	PT-1593	**INSTRUCTION PLATE** (Rep'l. PT-897)	1
	PT-770	**INSTRUCTION PLATE GASKET**	1
4	PT-347	**SCREW** for instruction plate, 1/4"-20 x 3/8" round head	2
5	PT-360	**ALEMITE FITTING,** No. 1610..........................	1
6	UPT-684-3	**DRIVE SHAFT ASSEM.** (Incl. Ref. No. 5)	1
		PT-684 replaced by UPT-684-3.	
7	PT-972	**SHAFT BEARING,** Wis. Motor No. **ME-195**	1
8	PT-807	**SNAP RING** on shaft for bearing	1
		PT-191 replaced by PT-807.	
9	PT-938	**SNAP RING** in housing for bearing....................	1
10	PT-200	**SHIFTER SHAFT**..	1
11	PT-351	**KEY** for shifter yoke, No. 15 Woodruff	2
12	UPT-199	**SHIFTER YOKE** (Incl. Ref. No's. 13, 14)	1
13	PT-352	**CLAMP SCREW** for yoke, 3/8"-16 x 1¼" hex.	2
14	PT-353	**LOCKWASHER** for yoke clamp screw, 3/8"....	2
15	UPT-769	**SHIFTING LEVER** (Incl. Ref. No's. 16, 17) ..	1
16	PT-404	**CLAMP SCREW** for shifting lever, 3/8"-16 x 1-1/2" hexagon	1
17	PT-353	**LOCKWASHER** for lever clamp screw, 3/8"	1
18	PT-639	**PIPE NIPPLE** for Alemite fitting	1
19	PT-355	**ALEMITE FITTING** No. 1618	1
20	PT-395	**PILOT BEARING,** Wis. Motor No. **ME-190**......	1
	CL-5452	**ALEMITE FITTING,** No. 1743 (Not illustrated)	2
		For shifter shaft lubrication.	
21	CLA-1640-A	**CLUTCH ASSEMBLY** – Complete	1
		(Ref. No. 22 to 45).	
22	CL-2346	**BACK PLATE**..	1
23	UCL-8661-1	**ADJUSTING RING ASSEMBLY** Includes:	1
24		CL-3154-1 Adjustment lock	1
25		CL-3452 Lock pin	1
26	CL-3448	**ADJUSTING RING PLATE**	1
27	UCL-2348-1	**PRESSURE PLATE ASSEMBLY** Includes:	1
28		CL-3352 Cam block	4
29		CL-3917 Screw, 1/4"-20 thread x 3/8" long, fillister head	4
30		CL-3468 Lockwasher, 1/4" Shakeproof	4
31	UCL-1-3444-A	**SLEEVE** and **BEARING ASSEMBLY**	1
		(Replaces UCL-3444-A)	
		Consisting of:	
32	UCL-3444	**SLEEVE ASSEMBLY**	1
		Includes:	
33		CL-3089 Bushing	2
34	UCL-2-3091	**RELEASE BEARING ASSEMBLY**	1
		(Replaces UCL-1-3091).	
		Includes:	
35		CL-3443-1 Screw, 5/16"-24 thread x 1-5/8" long, hexagon..	2
36		CL-7356 Elastic stop nut, 5/16"-24 thread.	2
37	UCL-4281	**CAMSHAFT ASSEMBLY**	2
38	CL-2326	**RETURN SPRING**	4
39	CL-2355	**LEVER PIN**	2
40	CL-487	**COTTER PIN** for leverpin, 3/32" x 1/2" long	2
41	CL-4701	**WASHER** for lever pin, 3/16" I.D.	2
42	UCL-7-1191-3	**DRIVEN MEMBER ASSEMBLY** Includes:	1
43		CL-4491-43 Facing (Rep'l. (4) CL-1418)	1
44		CL-4491-43 Facing (Rep'l. (4) CL-1419)	1
45		CL-1011 Tubular rivet..	12
46	PT-668	**ALEMITE FITTING, No. 1930**..................................	1

IMPORTANT: **Always give Model, Specific** **Serial Numbers as shown on name plate.**

WW-83 CLUTCH DRIVE HUB AND HOUSING ASSEMBLY FOR ROCKFORD CLUTCH REDUCTION UNITS ON MVG4D ENGINE


NOTE: The drive hub and housing assembly part number is stamped on this tag.
CLUTCH REDUCTION UNIT
630
636
626
623
633
625
632
624
620
622
631
628
621
629
635
634
627

104571C

The Above Assembly is Suitable for Mounting the Following Clutch Reduction Units

Wisconsin Motor Part Number	Rockford Part Number	Reduction Ratio	Rotation at Take-Off Shaft	Net Weight		
				lbs	oz	
WC-314	GRA-586	2.05 to 1	Counter-Enginewise	80		**NOTE:** See Rockford illust and parts list for Clutch Reduction Unit Parts.
WC-315	GRA-589	2.50 to 1	Counter-Enginewise	82		
WC-316	GRA-584	3.90 to 1	Counter-Enginewise	85		

NOTE: Engines equipped with a Clutch Reduction Unit require a special main bearing plate, crankshaft and crankcase as follows:

BG-194-B-S1 MAIN BEARING PLATE ASSEMBLY (not illustrated)
Consisting of:
1 BG-194-B Bearing Plate
1 PH-278 Oil Seal

CA-69-E-2-S1 CRANKSHAFT ASSEMBLY (not illustrated) Includes:
1 GA-35A-1 Gear
2 ME-98 Bearings
1 PL-49 Key
1 RK-173 Oil Slinger

CA-69-D-2-S1 on MIL-E-11275-B and -A spec engines. – For replacement use CA-69-E-2-S1.

'THE PART NUMBER OF THE CRANKCASE CAN BE FOUND STAMPED ON THE TAKE-OFF END OF THE CRANKCASE ABOVE THE MAIN BEARING PLATE.

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
	WW-83	**DRIVE HUB** and **HOUSING ASSEMBLY**.. Consisting of the following parts:			
620	BO-169B-2	**HOUSING** for drive hub (No. 5 S.A.E.)..	1	29	8
621	NC-149	**DRIVE HUB**..........	1	18	
622	PC-287	**STUD** for housing to crankcase mounting	4		2
623	PH-278	**SEAL** for main bearing	1		3
624	PH-279	**RETAINER** for drive hub..........	1		3
625	QD-678	**CORK SEAL** for drive hub key	1		1
626	SD-79-B	**ASSEMBLY NUMBER TAG**	1		1
627	ME-190	**PILOT BEARING** (Furnished with clutch)	1		8
		STANDARD HARDWARE			
628	PD-15	**NUT,** 5/8"-18 thread, hexagon steel ..... For mounting housing to crankcase.	4		1
629	PE-4	**LOCKWASHER,** 5/16" Positive .... For mounting clutch to drive hub.	6		1

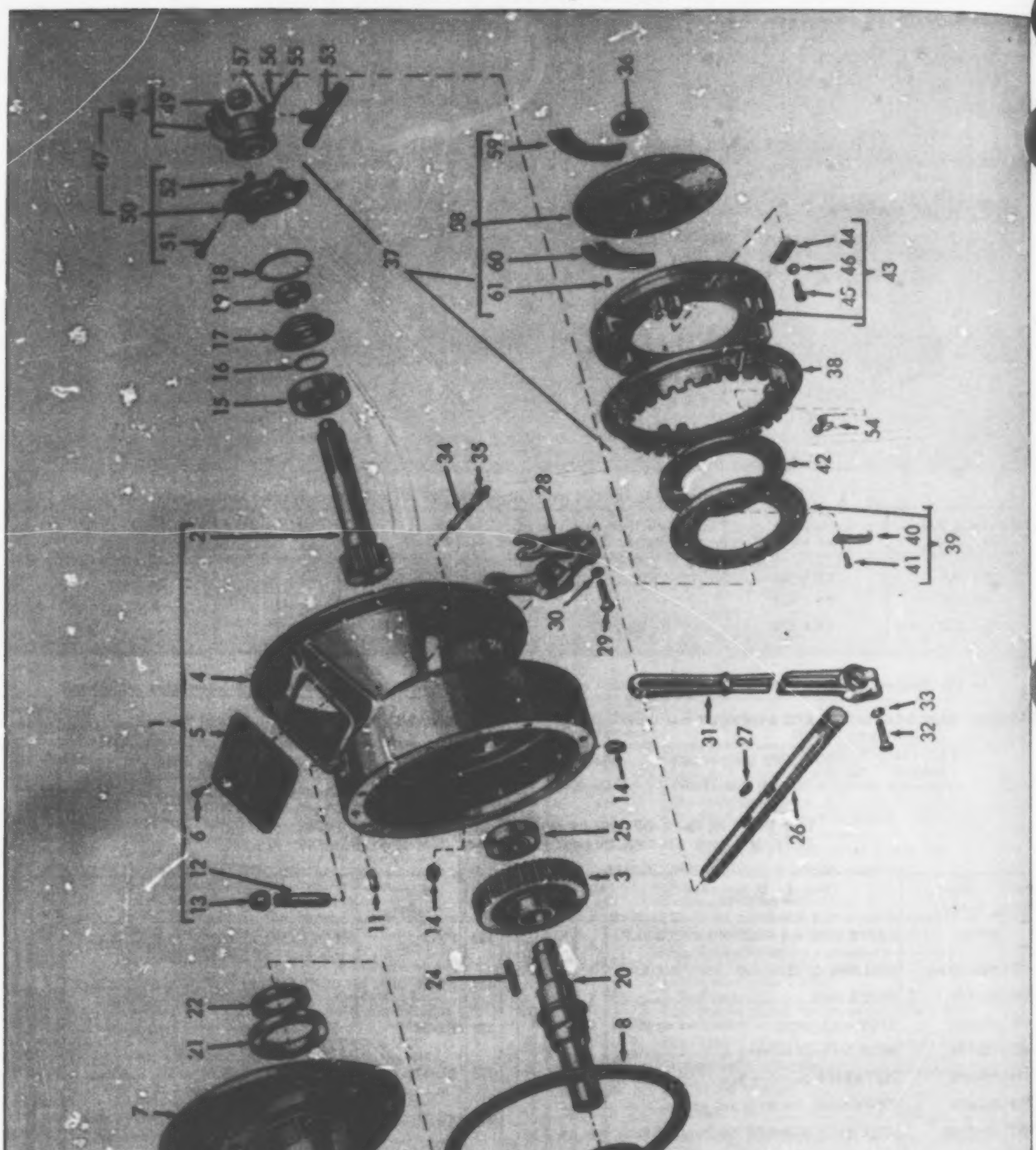
Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
630	PE-5	**LOCKWASHER,** 3/8" Positive.......... For mounting unit to housing.	8		1
631	PE-37	**LOCKWASHER,** 5/8" Positive.......... For mounting housing to crankcase.	4		1
632	PE-50	**LOCKWASHER,** 7/16" countersunk ..... For mounting hub retainer.	1		1
633	PL-122-1	**KEY,** No. 25 Woodruff .... For mounting drive hub.	1		1
634	XC-22	**SCREW,** 7/16"-14 thread x 1-1/4" long, flat head. For mounting hub retainer	1		1
635	XD-17	**SCREW,** 5/16"-18 thread x 1" long, hexagon head .... For mounting clutch to drive hub.	6		1
636	XD-27	**SCREW,** 3/8"-16 thread x 1" long, hexagon head.......... For mounting unit to housing.	8		1

IMPORTANT: Always give Model, Specification and Serial Numbers as shown on name plate.

REDUCTION UNIT ASSEMBLIES

Wisconsin Motor No's. WC-314, WC-315, WC-316

Rockford Part Numbers GRA-586, GRA-589, GRA-584


57
56
55
53
48
49
47
50
52
51
36
59
58
37
60
61
44
46
45
43
18
19
17
16
15
38
54
42
34
35
28
2
40
41
39
30
29
4
1
5
31
33
32
27
14
25
26
6
12
13
11
3
14
22
21
24
20
8
7
10
9
23

206586C-A

Parts are identified by reference number. See parts list for correct part number.

REDUCTION UNIT ASSEMBLIES

ROCKFORD PART NO.	WISCONSIN MOTOR PART NUMBER	REDUCTION RATIO
GRA-586	WC-314	2.05 to 1
GRA-589	WC-315	2.50 to 1
GRA-584	WC-316	3.90 to 1

Rockford Assembly No.	REF. No. 1 Housing Assembly Incl. Ref. No. 2 to 36	REF. No. 2 Drive Shaft and Gear	REF. No. 3 Driven Gear
GRA-586	GRA-5M6	GR-103 (21 teeth)	GR-102 (43 teeth)
GRA-589	GRA-5M7	GR-122 (18 teeth)	GR-108 (46 teeth)
GRA-584	GRA-5M4	GR-109 (13 teeth)	GR-110 (51 teeth)

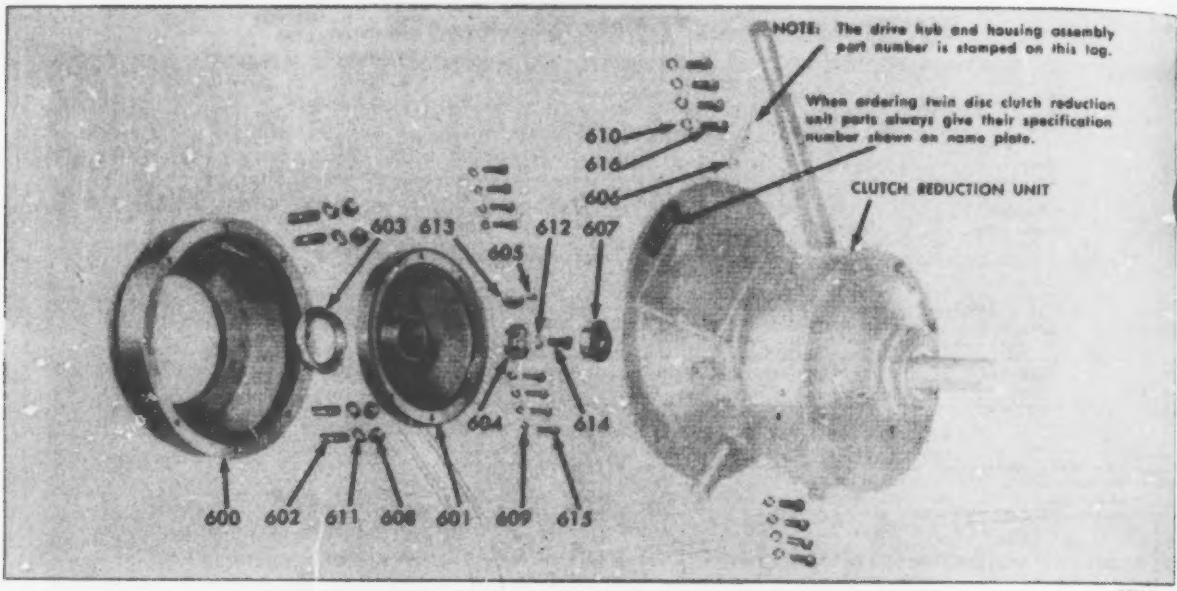
THE FOLLOWING PARTS ARE IDENTICAL FOR ALL THE ABOVE ASSEMBLIES

Ref. No.	Rockford Part Number	Description	No Req
4	GR-100	**No. 5 S.A.E. HOUSING**	1
5	PT-1593	**INSTRUCTION PLATE** (Rep'l. PT-897) ..	1
6	PT-347	**SCREW** for instruction plate, 1/4"-20 x 3/8" round head	2
7	GR-101	**HOUSING COVER**	1
8	GR-111	**GASKET** for housing cover	1
9	PT-469	**SCREW** for housing cover, 3/8"-16 x 1" hexagon head	8
10	PT-353	**LOCKWASHER** for cover screw, 3/8" Positive	8
11	GR-114	**DOWEL PIN** for cover, 3/8" x 1" long	1
12	GR-753	**PIPE NIPPLE** for oil filler, 3/8"	1
13	GR-236	**PIPE CAP** for oil filler, 3/8"	1
14	GR-117	**PIPE PLUG** for oil level and drain, 3/8" ..	3
15	PT-888	**BEARING** for drive shaft Wisconsin Motor No. **ME-194.**	1
16	PT-189	**SNAP RING** on shaft for bearing	1
17	GR-123	**SEAL RETAINER**	1
18	PT-192	**SNAP RING** in housing for bearing	1
19	GR-118	**OIL SEAL,** Perfect No. 20018	1
20	GR-104	**TAKE-OFF SHAFT**	1
21	GR-105	**SEAL RETAINER**	1
22	GR-119	**OIL SEAL,** Perfect No. 2992	1
23	GR-120	**BEARING** for take-off shaft Wisconsin Motor No. **ME-197.**	1
24	GR-106	**KEY** for driven gear	1
25	GR-121	**BEARING** for take-off shaft Wisconsin Motor No. **ME-198.**	1
26	PT-200	**SHIFTER SHAFT**	1
27	PT-351	**KEY** for shifter yoke, No. 15 Woodruff	2
28	PT-199	**SHIFTER YOKE**	1
29	PT-352	**CLAMP SCREW** for yoke, 3/8"-16 x 1¼" hex.	2
30	PT-353	**LOCKWASHER** for yoke clamp screw, 3/8"	2
31	PT-769	**SHIFTING LEVER**	1
32	PT-404	**CLAMP SCREW** for shifting lever, 3/8"-16 x 1-1/2" hexagon	1

Ref. No.	Rockford Part Number	Description	No Req
33	PT-353	**LOCKWASHER** for lever clamp screw, 3/8"	1
34	PT-639	**PIPE NIPPLE** for Alemite fitting	1
35	PT-355	**ALEMITE FITTING,** No. 1618	1
36	PT-395	**PILOT BEARING,** Wis. Motor No. **ME-190**	1
37	CL -1640-A	**CLUTCH ASSEMBLY COMPLETE** **(Ref. No. 38 to 61)**	1
38	CL-2346	**BACK PLATE**	1
39	UCL-8681-1	**ADJUSTING RING ASSEMBLY** Includes:	1
40		CL-3154-1 Adjustment lock	1
41		CL-3452 Lock pin	1
42	CL-3448	**ADJUSTING RING PLATE**	1
43	UCL-2348-1	**PRESSURE PLATE ASSEMBLY** Includes:	1
44		CL-3352 Cam block	4
45		CL-3917 Screw, 1/4"-20 thread x 3/8" long, fillister head	4
46		CL-3468 Lockwasher, 1/4" Shakeproof	4
47	UCL-1-3444-A	**SLEEVE** and **BEARING ASSEMBLY** (Replaces UCL-3444-A) Consisting of:	1
48	UCL-3444	**SLEEVE ASSEMBLY** Includes:	1
49		CL-3089 Bushing	2
50	UCL-2-3091	**RELEASE BEARING ASSEMBLY** (Replaces UCL-1-3091) Includes:	1
51		CL-3443-1 Screw, 5/16"-24 thread x 1-5/8" long, hexagon	2
52		CL-7356 Elastic stop nut, 5/16"-24 thread	2
53	UCL-4281	**CAM SHAFT ASSEMBLY**	2
54	CL-2326-1	**RETURN SPRING**	4
55	CL-2355	**LEVER PIN**	2
56	CL-487	**COTTER PIN** for lever pin, 3/32" x 1/2" long	2
57	CL-4701	**WASHER** for lever pin	2
58	UCL-7-1191-3	**DRIVEN MEMBER ASSEMBLY** Includes:	1
59		CL-4491-43 Facing (Rep'l. (4) CL-1418)..	1
60		CL-4491-43 Facing (Rep'l. (4) CL-1419)..	1
61		CL-1011 Tubular rivet	12
		CL-1830 Oil deflector	1
		CL-486 Rivet	6

IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

WW-80 DRIVE HUB AND HOUSING ASSEMBLY FOR TWIN DISC CLUTCH REDUCTION UNITS ON MVG4D ENGINE



NOTE: The drive hub and housing assembly part number is stamped on this tag.

When ordering twin disc clutch reduction unit parts always give their specification number shown on name plate.

99748C

The Above Assembly is Suitable for Mounting the Following Clutch Reduction Units

Wisconsin Motor Part Number	Twin Disc C-7-1/2, Model	Twin Disc Drawing No.	Reduction Ratio	Rotation at Take-Off Shaft	Net Weight	
					lbs	oz
WC-249-1	C107E2RG5	X 8515	2.56 to 1	Engine-wise	89	
WC-250-1	C107E3RG5	X 8515	3.60 to 1	Engine-wise	90	
WC-251-1	C107E5RG5	X 8516	4.90 to 1	Engine-wise	92	
WC-252-1	C107A2RG5	X 8518	2.50 to 1	Counter-enginewise	83	
WC-253-1	C107A4RG5	X 8518	3.90 to 1	Counter-enginewise	85	

NOTE: See Twin Disc illustration and parts list for clutch reduction unit parts. Always give their specification, number shown on name plate, when ordering parts.

NOTE: Engines equipped with a Clutch Reduction Unit require a special main bearing plate, crankshaft and crankcase as follows:

BG-194-B-S1 MAIN BEARING PLATE ASSEMBLY (not illustrated)
Consisting of:
1 BG-194-B Bearing Plate
1 PH-278 Oil Seal

CA-69-E-2-S1 CRANKSHAFT ASSEMBLY (not illustrated) Includes:
1 GA-35-A-1 Gear
2 ME-98 Bearings
1 PL-49 Key
1 RK-173 Oil Slinger

CA-69-D-2-S1 on MIL-E-11275-B and -A spec engines. — For replacement use CA-69-E-2-S1.

THE PART NUMBER OF THE CRANKCASE CAN BE FOUND STAMPED ON THE TAKE-OFF END OF THE CRANKCASE ABOVE THE MAIN BEARING PLATE.

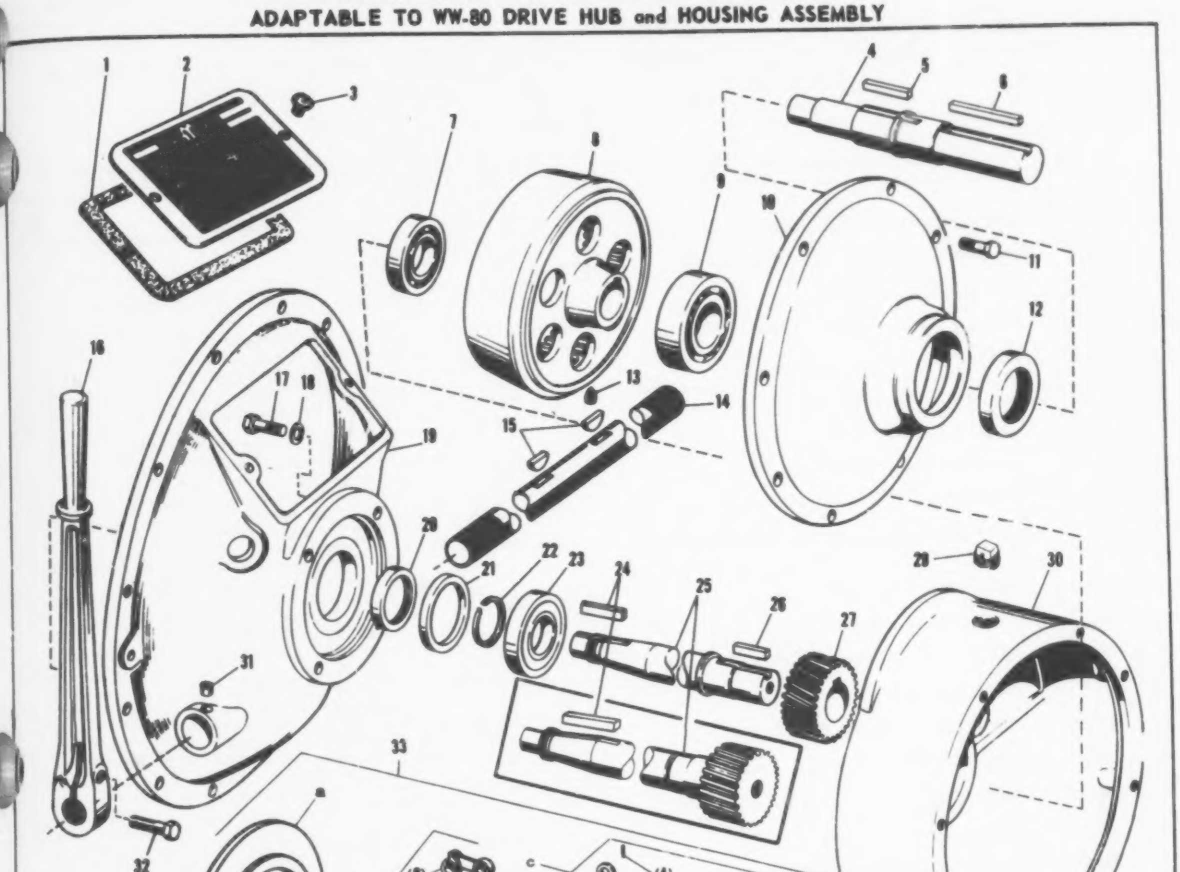
Ref. No.	Part Number	Description	No. Req	Net Wt.	
				Lb	Oz
	WW-80	**DRIVE HUB** and **HOUSING ASSEMBLY**.. Consisting of the following parts:			
600	**BO-169-B-2**	**HOUSING** for drive hub (No. 5 S.A.E.) ..	1	29	8
601	**NC-135A-1**	**DRIVE HUB**	1	13	
602	**PC-287**	**STUD** for housing to crankcase mounting	4		2
603	**PH-278**	**SEAL** for main bearing	1		3
604	**PH-279**	**RETAINER** for drive hub	1		3
605	**QD-678**	**CORK SEAL** for drive hub key	1		1
606	**SD-79-B**	**ASSEMBLY NUMBER TAG**.........................	1		1
607		Strom No. 205F pilot bearing .... (Furnished with clutch)	1		8
		STANDARD HARDWARE			
608	**PD-15**	**NUT,** 5/8"-18 thread, hexagon steel....... For mounting housing to crankcase.	4		1
609	**PE-4**	**LOCKWASHER,** 5/16" Positive.............. For mounting clutch to drive hub.	8		1
610	**PE-5**	**LOCKWASHER,** 3/8" Positive .... For mounting unit to housing.	8		1
611	**PE-37**	**LOCKWASHER,** 5/8" Positive .... For mounting housing to crankcase.	4		1
612	**PE-50**	**LOCKWASHER,** 1/16" countersunk ...... For mounting hub retainer.	1		1
613	**PL-122-1**	**KEY,** No. 25 Woodruff .... For mounting drive hub.	1		1
614	**XC-22**	**SCREW,** 7/16"-14 thread x 1-1/4" long, flat head. For mounting hub retainer......	1		1
615	**XD-19**	**SCREW,** 5/16"-18 thread x 1-1/4" long, hexagon head .... For mounting clutch to drive hub.	8		1
616	**XD-27**	**SCREW,** 3/8"-16 thread x 1" long, hexagon head .... For mounting unit to housing.	8		1

IMPORTANT: Always give Model, Specific[illegible] Serial Numbers as shown on name plate.

TWIN DISC CLUTCH REDUCTION UNIT ASSEMBLIES

TWIN DISC PART NOs. C107E2.5RG5 and C107E3RG5
WISCONSIN MOTOR PART NOs. WC-249-1 and WC-250-1

ADAPTABLE TO WW-80 DRIVE HUB and HOUSING ASSEMBLY


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
30
31
32
33
a
b
c
(1)
(2)
(3)
(4)
(5)
(6)
(a)
(b)
(c)
(d)
(8)
f
34
35
36
37
38
39
d
e
g
40
41
42
43
44
45
46

REDUCTION GEAR
C-107E2.5RG5
C-107E3RG5

Parts are identified by reference number. See parts list for correct part number.

TWIN DISC CLUTCH REDUCTION UNIT ASSEMBLIES

TWIN DISC PART NO.	WISCONSIN MOTOR PART NO.	REDUCTION RATIO	ROTATION
C-107-E2.5-RG5, SPEC. 15356	WC-249-1	2.56 to 1	Engine-wise
C-107-E3-RG5, SPEC. 15619	WC-250-1	3.60 to 1	Engine-wise

PARTS LIST

ALL PARTS ARE INTERCHANGEABLE ON THE ABOVE TWIN DISC CLUTCH REDUCTION UNITS, EXCEPT WHERE NOTED.

Ref. No.	Twin Disc Part Number	Description	No Req
1	A1339	**GASKET**, plate, specification	1
2	1965R	**PLATE**, specification	1
3	M2023P	**SCREW**, cap, button-head, 1/4-20 x 1/2	2
4	A3093	**SHAFT**, counter	1
5	M2032AY	**KEY**, 3/8 x 3/8 x 1-1/2	1
6	M2032BH	**KEY**, 3/8 x 3/8 x 3-1/4	1
7	M1586	**BALL BEARING** (5204-SBK)	1
8	6381A	**DRIVEN GEAR**, internal (for WC-249-1 only) 2.56:1 reduction	1
	6984	**DRIVEN GEAR**, internal (for WC-250-1 only) 3.60:1 reduction	1
9	M174	**BALL BEARING** (308-M)	1
10	6974	**PLATE**, cover	1
11	M2001M	**SCREW**, cap, hex-head, 5/16-18 x 7/8	8
12	M417	**SEAL**, oil, shaft, counter	1
13	M2039E	**SETSCREW**, half-dog-point, 1/2-13 x 5/8	1
14	2757	**SHAFT**, operating	1
15	M2022V	**KEY**, Woodruff	2
16	3799	**LEVER**, hand	1
17	M2006H	**SCREW**, cap, hex-head, 5/8-11 x 1-1/2	4
18	M2046AF	**WASHER**, lock, 5/8-inch	4
19	7611	**HOUSING**, clutch, No. 5 S.A.E.	1
20	M105	**SEAL**, oil, shaft, clutch	1
21	2909	**SPACER**	1
22	2923	**RING**, snap	1
23	M144	**BALL BEARING** (207-MF)	1
24	M2032X	**KEY**, 1/4 x 1/4 x 1-7/8	1
25	A3094	**SHAFT**, clutch (for WC-249-1 only) 2.56:1 reduction	1
	A3095	**CLUTCH SHAFT** and **GEAR** (for WC-250-1 only) 3.60:1 reduction	1
26	M2032AL	**GEAR KEY**, 5/16 x 5/16 x 1-1/8 (for WC-249-1 only)	1
27	2944A	**DRIVE GEAR**, clutch (for WC-249-1 only) 2.56:1 reduction	1
29	1340A	**PIPE PLUG**, breather, oil	1
30	6378D	**HOUSING**, gear	1

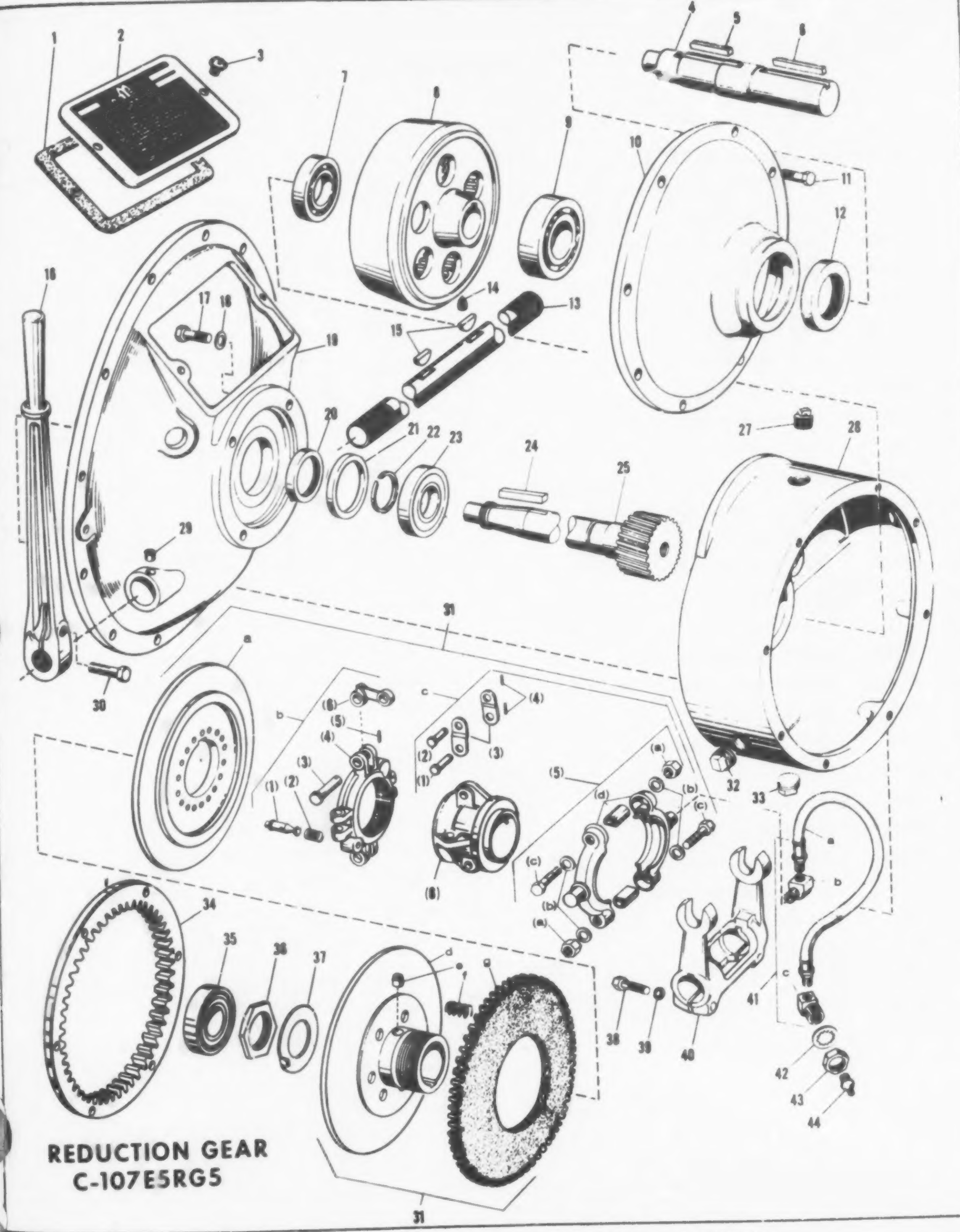
Ref. No.	Twin Disc Part Number	Description	No Req
31	M102	**CUP**, oil	2
32	M2004R	**SCREW**, cap, hex-head, 1/2-13 x 1-3/4	1
33	XA5060	**CLUTCH**, assembly, Model C-107	1
a	A3087	**PLATE**, floating	1
b	A-16	**YOKE**, adjusting, assembly	1
(1)	2042	**PIN**, lock, adjusting	1
(2)	1382	**SPRING**, pin, lock, adjusting	1
(3)	B1527A	**PIN**, lever, finger	4
		1871A pins and M642 snap rings, replaced by B1527A and M1927AS.	
(4)	3206	**YOKE**, adjusting	1
(5)	M1927AS	**PIN**, roll	4
(6)	2411	**LEVER**, finger	4
c	S-387	**SLEEVE**, sliding, assembly	1
(1)	B1527C	**PIN**, link, lever	4
		2131A pins and M642 snap rings, replaced by B1527C and M1927AS.	
(2)	B1527B	**PIN**, link, lever	4
		1900A pins and M642 snap rings, replaced by B1527B and M1927AS.	
(3)	2968	**LINK**, lever	8
(4)	M1927AS	**PIN**, roll	8
(5)	X117C8S	**COLLAR**, split, assembly	1
(a)	M1930F	**NUT**, hex, 3/8-24	2
(b)	1395A	**WASHER**, plain, 3/8-inch	4
(c)	M2002AS	**SCREW**, cap, hex-head, 3/8-24 x 1-3/4	2
(d)	117C8S	**COLLAR**, split (not serviced separately)	1
(6)	2969	**SLEEVE**, sliding, assembly	1
d	A3088	**PLATE**, hub-and-back	1
e	110D3	**PIN**, hub-and-back	1
f	A2286	**SPRING**, release	6
g	A5436S	**PLATE**, driving	1
34	M2051X	**OIL LEVEL PLUG**, square-head, ½-inch pipe	1
35	M2051X	**OIL DRAIN PLUG**, square-head, ½-inch pipe	1
36	6661	**RING**, driving	1
37	M141	**BALL BEARING**, pilot (205 SF)	1
38	2727	**NUT**, hub	1
39	A1587	**WASHER**, lock	1
40	M2002AG	**SCREW**, cap, hex-head, 3/8-16 x 1-1/2	2
41	M2046S	**WASHER**, lock, 3/8-inch	2
42	1037	**FORK**, throwout	1
43	A1663	**HOSE**, flexible, assembly	1
a	M1292A	**HOSE**, flexible	1
b	M1284	**FITTING**, 90-degree	1
c	M1283	**FITTING**, straight	1
44	M2046AF	**WASHER**, lock, 5/8-inch	1
45	M2027AN	**NUT**, jam, 5/8-18	1
46	M268	**FITTING**, hydraulic, 1/8-inch	1

IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

TWIN DISC CLUTCH REDUCTION UNIT ASSEMBLY

TWIN DISC PART NO. C107E5RG5 WISCONSIN MOTOR PART NO. WC-251-1

ADAPTABLE TO WW-80 DRIVE HUB and HOUSING ASSEMBLY


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
27
28
29
30
31
a
b
(6)
(5)
(4)
(3)
(1)
(2)
c
(4)
(2)
(1)
(3)
(8)
(5)
(a)
(d)
(b)
(c)
(c)
(b)
(a)
32
33
a
b
c
34
35
36
37
d
e
f
g
38
39
40
41
42
43
44
31

REDUCTION GEAR C-107E5RG5

Parts are identified by reference number. See parts list for correct part number.

TWIN DISC CLUTCH REDUCTION UNIT ASSEMBLY

TWIN DISC PART NO.	WISCONSIN MOTOR PART NO.	REDUCTION RATIO	ROTATION
C-107-ES-RG5, SPEC. 15759	WC-251-1	4.90 to 1	Engine-wise

PARTS LIST

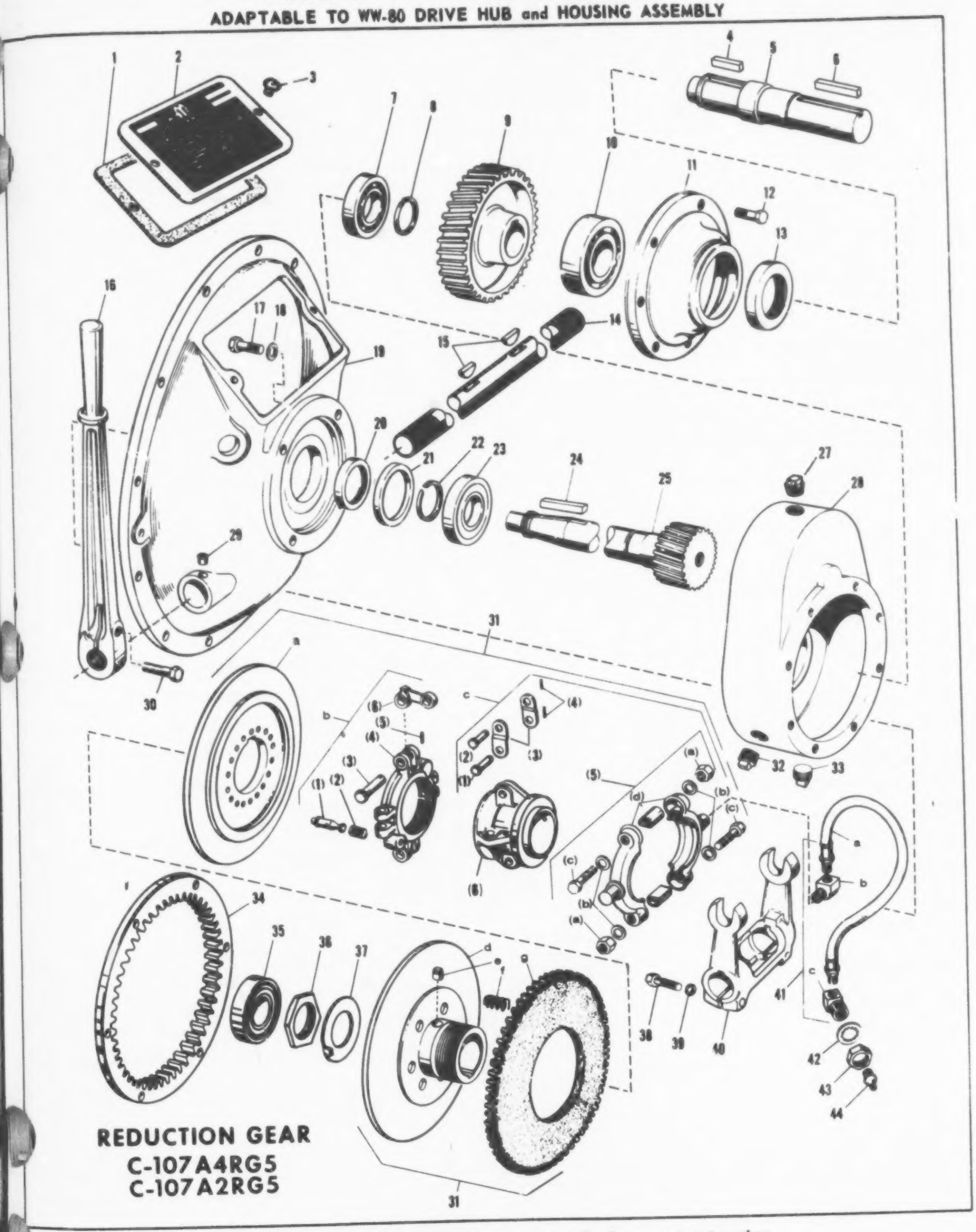
Ref No	Twin Disc Part Number	Description	No Req
1	A1339	**GASKET**, plate, specification	1
2	1965R	**PLATE**, specification	1
3	M2023F	**SCREW**, cap, button-head, 1/4-20 x 1/2	2
4	A3098	**SHAFT**, counter	1
5	M2032AY	**KEY**, 3/8 x 3/8 x 1-1/2	1
6	M2033B	**KEY**, 7/16 x 7/16 x 2-7/8	1
7	M166	**BALL BEARING** (306-M)	1
8	6381A	**DRIVEN GEAR**, internal	1
9	M178	**BALL BEARING** (309-M)	1
10	6981	**PLATE**, cover	1
11	M2001M	**SCREW**, cap, hex-head, 5/16-18 x 7/8	8
12	M605	**SEAL**, oil, shaft, counter	1
13	2757	**SHAFT**, operating	1
14	M2039E	**SETSCREW**, half-dog-point, 1/2-13 x 5/8	1
15	M2022V	**KEY**, Woodruff	2
16	3799	**LEVER**, hand	1
17	M2006H	**SCREW**, cap, hex-head, 5/8-11 x 1-1/2	4
18	M2046AF	**WASHER**, lock, 5/8-inch	4
19	7611	**HOUSING**, clutch, No. 5 S.A.E.	1
20	M105	**SEAL**, oil, shaft, clutch	1
21	2909	**SPACER**	1
22	2923	**RING**, snap	1
23	M144	**BALL BEARING** (207-MF)	1
24	M2032X	**KEY**, 1/4 x 1/4 x 1-7/8	1
25	A3097	**CLUTCH SHAFT** and **GEAR**	1
27	1340A	**PIPE PLUG**, breather, oil	1
28	6406A	**HOUSING**, gear	1
29	M102	**CUP**, oil	2
30	M2004R	**SCREW**, cap, hex-head, 1/2-13 x 1-3/4	1
31	XA5060	**CLUTCH**, assembly, Model C-107	1
a	A3087	**PLATE**, floating	1
b	A-16	**YOKE**, adjusting, assembly	1
(1)	2042	**PIN**, lock, adjusting	1
(2)	1382	**SPRING**, pin, lock, adjusting	1
(3)	B1527A	**PIN**, lever, finger	4
		1871A Pins and M642 snap rings, replaced by B1527A and M1927AS.	
(4)	3206	**YOKE**, adjusting	1
(5)	M1927AS	**PIN**, roll	4
(6)	2411	**LEVER**, finger	4
c	S-387	**SLEEVE**, sliding, assembly	1
(1)	B1527C	**PIN**, link, lever	4
		2131A pins and M642 snap rings, replaced by B1527C and M1927AS.	
(2)	B1527B	**PIN**, link, lever	4
		1900A pins and M642 snap rings, replaced by B1527B and M1927AS.	
(3)	2968	**LINK**, lever	8
(4)	M1927AS	**PIN**, roll	8
(5)	X117C8S	**COLLAR**, split, assembly	1
(a)	M1930F	**NUT**, hex, 3/8-24	2
(b)	1395A	**WASHER**, plain, 3/8-inch	4
(c)	M2002AS	**SCREW**, cap, hex-head, 3/8-24 x 1-3/4	2
(d)	117C8S	**COLLAR**, split (not serviced separately)	1
(6)	2969	**SLEEVE**, sliding, assembly	1
d	A3088	**PLATE**, hub-and-back	1
e	110D3	**PIN**, hub-and-back	1
f	A2286	**SPRING**, release	6
g	A5436S	**PLATE**, driving	1
32	M2051X	**OIL LEVEL PLUG**, square-head, ½-inch pipe	1
33	M2051X	**OIL DRAIN PLUG**, square-head, ½-inch pipe	1
34	6661	**RING**, driving	1
35	M141	**BALL BEARING**, pilot (205-SF)	1
36	2727	**NUT**, hub	1
37	A1587	**WASHER**, lock	1
38	M2002AG	**SCREW**, cap, hex-head, 3/8-16 x 1-1/2	2
39	M2046S	**WASHER**, lock, 3/8-inch	2
40	1037	**FORK**, throwout	1
41	A1663	**HOSE**, flexible, assembly	1
a	M1292A	**HOSE**, flexible	1
b	M1284	**FITTING**, 90-degree	1
c	M1283	**FITTING**, straight	1
42	M2046AF	**WASHER**, lock, 5/8-inch	1
43	M2027AN	**NUT**, jam, 5/8-18	1
44	M268	**FITTING**, hydraulic, 1/8-inch	1

IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

TWIN DISC CLUTCH REDUCTION UNIT ASSEMBLIES

TWIN DISC PART NOs. C107A2RG5 and C107A4RG5
WISCONSIN MOTOR PART NOs. WC-252-1 and WC-253-1

ADAPTABLE TO WW-80 DRIVE HUB and HOUSING ASSEMBLY


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
27
28
29
30
31
a
b
c
(1)
(2)
(3)
(4)
(5)
(6)
(a)
(b)
(c)
(d)
32
33
34
35
36
37
d
e
f
g
38
39
40
41
42
43
44

REDUCTION GEAR
C-107A4RG5
C-107A2RG5

Parts are identified by reference number. See parts list for correct part number.

TWIN DISC CLUTCH REDUCTION UNIT ASSEMBLIES

TWIN DISC PART NO.	WISCONSIN MOTOR PART NO.	REDUCTION RATIO	ROTATION
C-107-A2-RG5, SPEC. 15516	WC-252-1	2.50 to 1	Counter enginewise
C-107-A4-RG5, SPEC. 15748	WC-253-1	3.90 to 1	Counter-enginewise

PARTS LIST

ALL PARTS ARE INTERCHANGEABLE ON THE ABOVE TWIN DISC CLUTCH REDUCTION UNITS, EXCEPT WHERE NOTED.

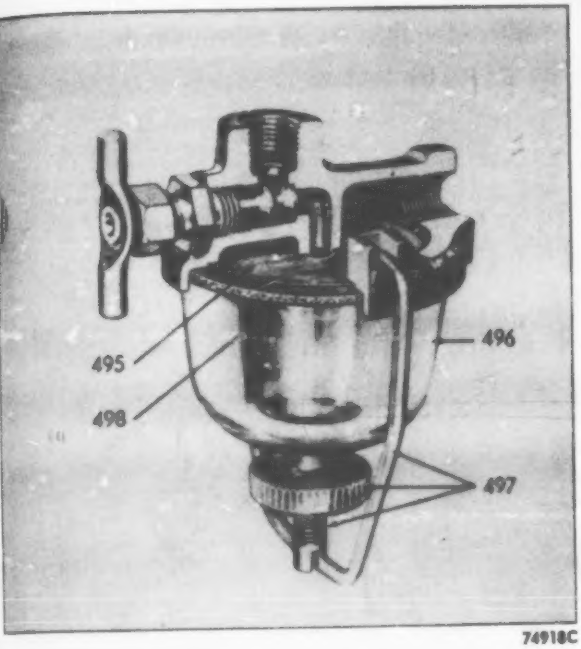
Ref No	Twin Disc Part Number	Description	No Req
1	A1339	**GASKET**, plate, specification	1
2	1965R	**PLATE**, specification	1
3	M2023F	**SCREW**, cap, button-head, 1/4-20 x 1/2	2
4	M2032BC	**KEY**, 3/8 x 3/8 x 2	1
5	A3110	**SHAFT**, counter	1
6	M2032BE	**KEY**, 3/8 x 3/8 x 2-1/2	1
7	M143	**BALL BEARING**	1
8	A1358	**RING**, snap	1
9	A3108	**GEAR** (for WC-252-1 only) 2.5:1 reduction	1
	A3109	**GEAR** (for WC-253-1 only) 3.9:1 reduction	1
10	M174	**BALL BEARING** (308-M)	1
11	6997	**PLATE**, cover	1
12	M2001M	**SCREW**, cap, hex-head, 5/16-18 x 7/8	8
13	M417	**SEAL**, oil, shaft, counter	1
14	2757	**SHAFT**, operating	1
15	M2022V	**KEY**, Woodruff	2
16	3799	**LEVER**, hand	1
17	M2006H	**SCREW**, cap, hex-head, 5/8-11 x 1-1/2	4
18	M2046AF	**WASHER**, lock, 5/8-inch	4
19	7611	**HOUSING**, clutch, No. 5 S.A.E.	1
20	M105	**SEAL**, oil, shaft, clutch	1
21	2909	**SPACER**	1
22	2923	**RING**, snap	1
23	M144	**BALL BEARING** (207-MF)	1
24	M2032X	**KEY**, 1/4 x 1/4 x 1-7/8	1
25	A3111	**CLUTCH SHAFT** and **PINION** (for WC-252-1 only) 2.5:1 reduction	1
	A3097	**CLUTCH SHAFT** and **PINION** (for WC-253-1 only) 3.9:1 reduction	1
27	1340A	**PIPE PLUG**, breather, oil	1
28	8528	**HOUSING**, gear	1
29	M102	**CUP**, oil	2
30	M2004R	**SCREW**, cap, hex-head, 1/2-13 x 1-3/4	1

Ref No	Twin Disc Part Number	Description	No Req
31	XA5060	**CLUTCH**, assembly, Model C-107	1
a	A3087	**PLATE**, floating	1
b	A-16	**YOKE**, adjusting, assembly	1
(1)	2042	**PIN**, lock, adjusting	1
(2)	1382	**SPRING**, pin, lock, [illegible]	[illegible]
(3)	B1527A	**PIN**, lever, finger 1871A pins and M642 snap rings, replaced by B1527A and M1927AS.	4
(4)	3206	**YOKE**, adjusting	1
(5)	M1927AS	**PIN**, roll	4
(6)	2411	**LEVER**, finger	4
c	S-387	**SLEEVE**, sliding, assembly	1
(1)	B1527C	**PIN**, link, lever 2131A pins and M642 snap rings, replaced by B1527C and M1927AS.	4
(2)	B1527B	**PIN**, link, lever 1900A pins and M642 snap rings, replaced by B1527B and M1927AS.	4
(3)	2968	**LINK**, lever	8
(4)	M1927AS	**PIN**, roll	8
(5)	X117C8S	**COLLAR**, split, assembly	1
(a)	M1930F	**NUT**, hex, 3/8-24	2
(b)	1395A	**WASHER**, plain, 3/8-inch	4
(c)	M2002AS	**SCREW**, cap, hex-head, 3/8-24 x 1-3/4	2
(d)	117C8S	**COLLAR**, split (not serviced separately)	1
(6)	2969	**SLEEVE**, sliding, assembly	1
d	A3088	**PLATE**, hub-and-back	1
e	110D3	**PIN**, hub-and-back	1
f	A2286	**SPRING**, release	6
g	A5436S	**PLATE**, driving	1
32	M2051X	**OIL LEVEL PLUG**, square-head, ½-inch pipe	1
33	M2051X	**OIL DRAIN PLUG**, square-head, ½-inch pipe	1
34	6661	**RING**, driving	1
35	M141	**BALL BEARING**, pilot (205-SF)	1
36	2727	**NUT**, hub	1
37	A1587	**WASHER**, lock	1
38	M2002AG	**SCREW**, cap, hex-head, 3/8-16 x 1-1/2	2
39	M2046S	**WASHER**, lock, 3/8-inch	2
40	1037	**FORK**, throwout	1
41	A1663	**HOSE**, flexible, assembly	1
a	M1292A	**HOSE**, flexible	1
b	M1284	**FITTING**, 90-degree	1
c	M1283	**FITTING**, straight	1
42	M2046AF	**WASHER**, lock, 5/8-inch	1
43	M2027AN	**NUT**, jam, 5/8-18	1
44	M268	**FITTING**, hydraulic, 1/8-inch	1

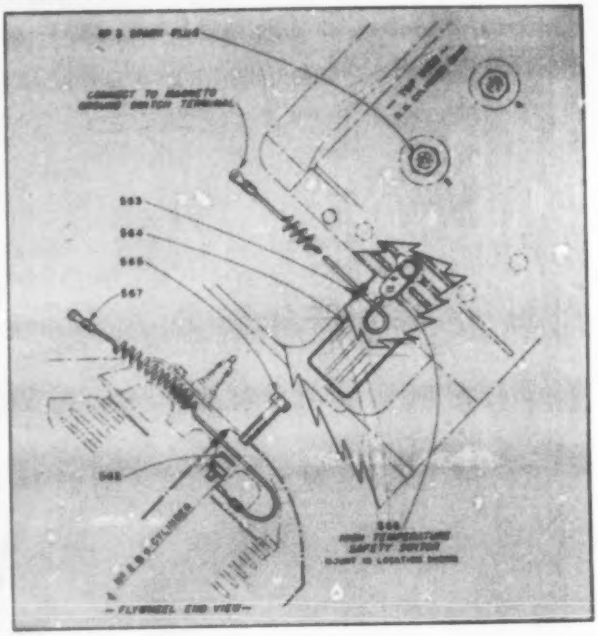
IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

FUEL STRAINER ASSEMBLIES

YC-66-D-S1 HIGH TEMP SAFETY SWITCH KIT FOR MVG4D ENGINE



74918C

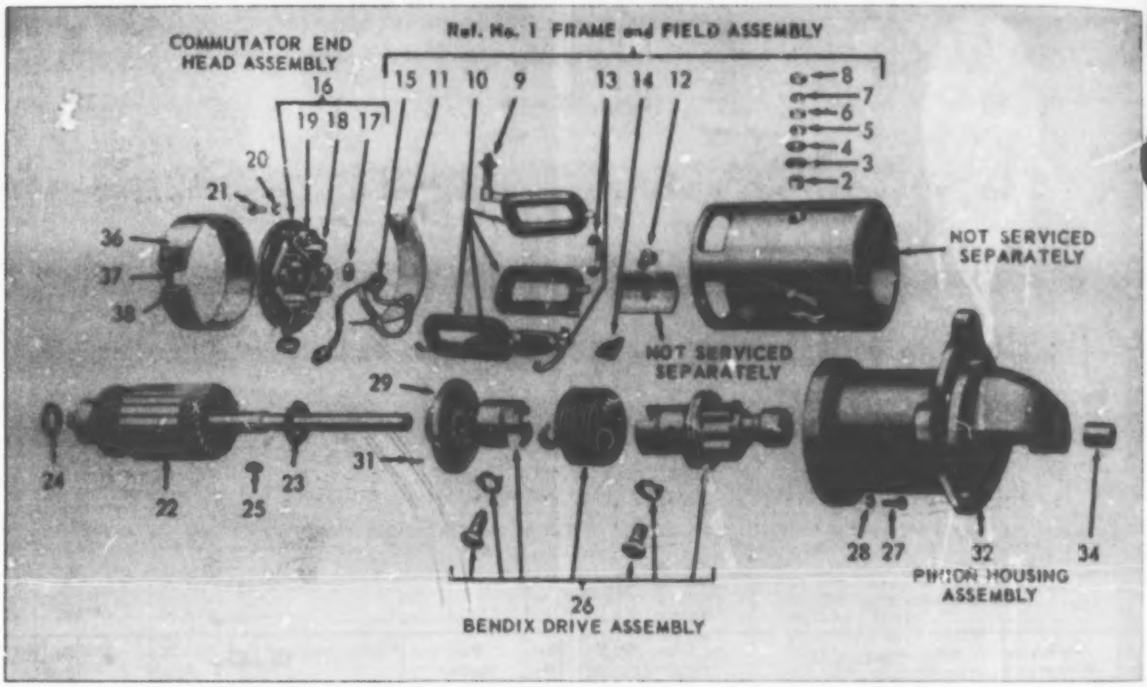

CONNECT TO MAGNETO GROUND SWITCH TERMINAL
563
564
565
567
562
566
HIGH TEMPERATURE SAFETY SWITCH
MOUNT IN LOCATION SHOWN
— FLYWHEEL END VIEW —

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
	LP-19	**FUEL STRAINER ASSEMBLY**.............. (With Shut-off valve in cover, and glass bowl) Tillotson No. OW-418-T.	1		8
	LP-19-A	**FUEL STRAINER ASSEMBLY**.............. (With Shut-off valve in cover, and metal bowl) Tillotson No. OW-449-T.	1		7
	LP-19-B	**FUEL STRAINER ASSEMBLY**.............. (Without Shut-off valve in cover, and glass bowl) Tillotson No. OW-444.	1		6
	LP-19-C	**FUEL STRAINER ASSEMBLY**.............. (Without Shut-off valve in cover, and metal bowl) Tillotson No. OW-476-T.	1		5
		The following serviceable parts are interchangeable for all the above fuel strainers.			
583	OW-352	**FILTER SCREEN**	1		1
584	OW-363	**GLASS BOWL**	1		2
	06137	**METAL BOWL**	1		1
585	OW-447	**CLAMP WIRE** and **THUMB NUT ASSEMBLY**	1		1
586	06096	**BOWL GASKET** (Wisconsin No. QD-653)	1		5

Ref. No.	Part Number	Description	No. Req	Net Wt. Lb	Net Wt. Oz
	YC-66-D-S1	**HIGH TEMPERATURE SAFETY SWITCH KIT** – Complete........................ Consisting of:			8
562	PH-22	**WASHER**, 3/8" I.D., plain steel .... For switch to cylinder head mounting.	1		1
563	PH-377-B	**GROMMET** for ignition wire	1		1
564	SD-233	**INSTRUCTION DECAL**..........................	1		1
565	XD-31	**CAPSCREW**, 3/8"-16 thread x 1¾" long, hexagon head .... For switch to cylinder head mounting.	1		1
566	YC-66-D	**HIGH TEMPERATURE SAFETY SWITCH** .... For replacement, order YC-66-D-S1 Kit.	1		3
567	YL-357-42	**WIRE ASSEMBLY**, 42" long, with terminals. (Wire coiled to suit all models.)	1		1

IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

PRESTOLITE MBP-4012T (24 Volt) STARTING MOTOR PARTS LIST
WISCONSIN MOTOR PART NUMBER YA-20A-1



2100678

Ref. No.	Prestolite Part Number	Description	No Req
1	MBP-2001BS	**FRAME** and **FIELD ASSEMBLY**	1
		Consisting of:	
2	Not Serviced See Note	INSULATING BUSHING for terminal stud	1
3		INSULATING WASHER for terminal stud	1
4		PLAIN WASHER for terminal stud	1
5		LOCKWASHER for terminal stud	1
6		NUT for terminal stud	1
7	12X-1014	LOCKWASHER, 5/16", for terminal stud	1
8	X-180	NUT for terminal stud, 5/16"-24 thread, hex.	1
9	Not Serviced See Note	TERMINAL STUD	1
10		FIELD COIL ASSEMBLY	1
11		INSULATION for field coils	1
12		SCREW for pole shoe	4
13		CONNECTOR for field coil	2
14		INSULATION	1
15	MBW-2012CS	BRUSH SET (includes Ref. No. 18)	1
16	MBP-2002A	**COMMUTATOR END HEAD ASSEMBLY**	1
		Includes:	
17	MAD-110	FELT	1
18	MBP-1034AS	GROUNDED BRUSH (Part of Ref. No. 15)	2
19	MZ-19C	BRUSH SPRING	4
20	12X-196	**LOCKWASHER** for head screw, No. 10	4
21	20X-902	**SCREW** for head mounting No. 10-32 thread x 3/8" long, fillister head.	4
22	MBP-3366FT	**ARMATURE ASSEMBLY**	1
23	MBP-54	**THRUST WASHER** for armature	2
24	MU-54	**THRUST WASHER** for armature (1/32" thick)	1

Ref. No.	Prestolite Part Number	Description	No Re
25	X-261	**KEY** for mounting Bendix, No. 6 Woodruff	1
26	EBB-44B	**BENDIX DRIVE ASSEMBLY**	1
		Eclipse No. 480029.	
		(EBB-44-A, Eclipse No. A-3517, replaced by EBB-44B)	
		Consisting of the following Eclipse Part No's:	
		F-4610 LOCKWASHER	2
		F-4616 DRIVE HEAD	1
		F-4619 HEAD SCREW	1
		F-4618 SHAFT SCREW	1
		F-4855 DRIVE SPRING	1
		F-6533 SCREW SHAFT ASSEMBLY	1
		(F-6745 replaced by F-6533)	
		F-4721 SLEEVE (Not illustrated)	1
27	MZ-52B	**SCREW** for pinion housing mounting No. 10-32 thread x 31/32" long.	4
28	12X-196	**LOCKWASHER** for housing screw, No. 10	4
29	MZ-1360A	**BEARING ASSEMBLY**, intermediate	1
30	MZ-359A	**GASKET** for intermediate bearing (Not illustrated)	1
31	20X-63	**SCREW** for intermediate bearing No. 8-32 thread x 3/8" long, flat head.	4
32	PS-1330A	**PINION HOUSING ASSEMBLY**	1
		Includes:	
33	MZ-358A	BEARING CAP (not illustrated)	1
34	MZ-364	BRONZE BEARING	1
35	XA-832	OIL SEAL (not illustrated)	1
36	MZ-1024AD	**COVER BAND**	1
37	X-2882	**SCREW** for cover band No. 10-32 thread x 1½" long, fillister head.	1
38	X-2875	**NUT** for cover band No. 10-32 thread, square.	1

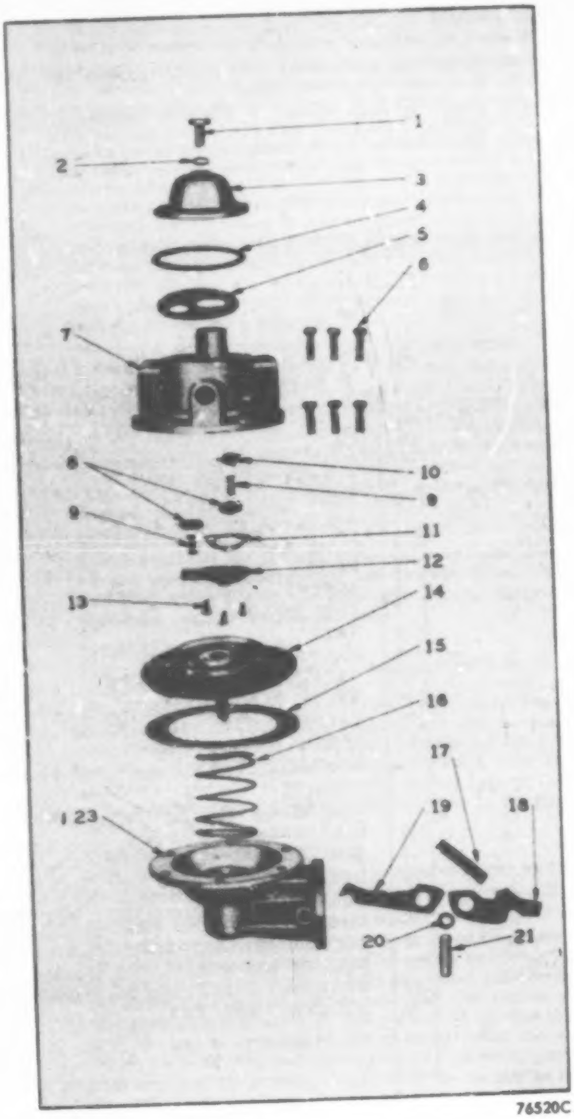
NOTE: Due to the method of installing field coils and other components in the frame and field of fungus resistant assemblies, it is necessary to replace the frame and field assembly if field coils are required.

FUEL PUMP MAINTENANCE AND REPAIR INSTRUCTIONS

WISCONSIN MOTOR PART No. LP-38 (Standard), LP-38-C (Cold Weather: -65°F)
USED ON 4 CYLINDER AIR COOLED ENGINES

The fuel pump, like all other parts of the engine, is subject to wear and you will find that any time after 500 hours of use, its efficiency will gradually decrease. This is indicated by the engines faltering at high speeds or when heavy loads are suddenly applied. The pump can easily be stored to its normal efficiency by the installation of a isconsin Motor No. LQ-30 or LQ-30-A repair kit.

1. Remove the fuel lines and the two mounting bolts which hold the pump to the engine. Take the pump to a work bench or suitable place.
2. With file make an indicating mark across a point at the union of castings (7 and 23). This is a positive location of the fuel line positions when reassembling. Remove six assembly screws (6) and remove fuel head. Dome bolt (1) is taken out, and the dome (3), dome gasket (4) and filter screen (5) disassembled.
3. Turn head (7) over and remove three screws (13). Remove (8, 9, 10, 11 and 12) valve assemblies noting their positions. Discard Details 8, 9 and 11.
4. Clean head thoroughly with gasoline and a fine brush.
5. Holding fuel head (7) with diaphragm surface (containing 6 clearance holes) up, reassemble the valve spring retainer (10) into position, deepest hole. Place new valve plate gasket (11) in position around this hole. Stand on end one of the new valve springs (9) in the retainer. Place a new valve (8) on top of this spring.
6. Place the other new valve (8) on top of brass valve seat next to the previously assembled parts, stand the other new valve spring (9) on top of this valve.
7. Carefully place valve plate (12) over these assemblies so the large raised ring is nearest the valve gasket (11). Insert and carefully tighten the three assembly screws (13).
8. Carefully clean and replace the filter screen (5).
9. Place new dome gasket (4) into the dome (3) and put this unit into position on the fuel head (7).
10. Put new dome bolt gasket (2) on the dome bolt (1), insert in the hole in the dome (3) and tighten properly.
11. Place this fuel head assembly in a clean place and we are ready to rebuild the lower diaphragm section.
12. Using a screw driver inserted into the coils of rocker arm spring (17) remove this spring and discard.
13. Hold the mounting bracket (23) in the left hand with the rocker arm toward your body and the thumb nail on the end of the link (19) with the heel of right hand on the diaphragm (14) compress the diaphragm spring (16) at the same time pulling toward your body, this will unhook the diaphragm from the link (19) so it can be removed.
14. Clean the mounting bracket (23) with gasoline.
15. Place the remaining new cork gasket (15) on the corresponding surface of the mounting bracket (23). Assemble the new diaphragm operating spring (16) standing it into (23). Now repeat in reverse Step 13 using the new diaphragm, rocker arm, pin, linkage and bushing. Assemble new rocker arm spring.
16. Mount this assembly back on the engine in the position from which it was removed, using the new mounting gasket which is the last piece of the repair kit.
17. Crank the engine over to a position where the diaphragm (14) is laying flat on the mounting bracket (23). Place the fuel head (7) back in position so the indicating marks of Step 1 are in line, and start the six assembly screws approximately three turns. Again crank the engine over to a position where the diaphragm (14) is pulled down into (23) mounting bracket and tighten the six assembly screws (6) tightly.
18. Connect the fuel lines and you have a completely rebuilt fuel pump.



76520C

INSTRUCTIONS FOR FUEL PUMP MAINTENANCE AND REPAIR

The gaskets (2 and 4) used in the fuel head (7) of the fuel pump have a natural tendency to shrink when left standing in a dry condition. This shrinking can create vacuum leaks which result in the hard starting of the engine. It is necessary after an engine has stood on the stockroom or show room floor any length of time that the dome bolt No. 1, the assembly screws (6) of which there are six and the fuel line connections be tightened carefully to assure quick starting and satisfactory operation thereafter.

CLEANING OF FUEL PUMP

The industrial engine is used under so many adverse conditions that many times a pump will fail because of the dirt in the fuel head. This can be cleaned by this procedure.

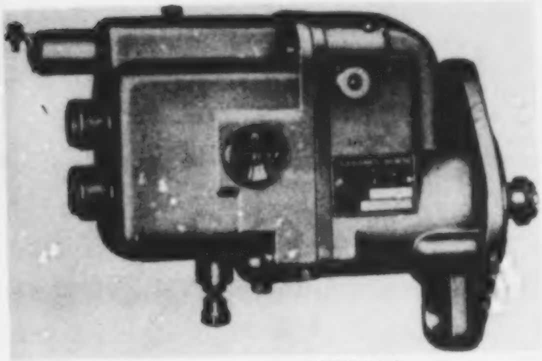
1. With file make an indicating mark across a point of the union of castings (7 and 23). This is a positive location of the fuel line positions when reassembling.
2. Remove the two fuel lines.
3. Remove six assembly screws (6) and remove fuel head.
4. Bolt (1) is taken out, and the dome (3), dome gasket (4) and filter screen (5) disassembled.
5. The preceding steps reveal the sediment cavities of the head which are filled with dirt. Wash this out with gasoline and a fine brush, being careful not to damage the valve assemblies, in the lower cavity of the fuel head (7).
6. The pump is now ready to reassemble. Crank the engine over to a position where the diaphragm (14) is laying flat across the casting face (23). Place the fuel head (7) back in position so the indicating marks of Step No. 1 are in line and start the six assembly screws approximately three turns. Again crank the engine over to a position where the diaphragm (14) is pulled down into (23) the mounting bracket. Now tighten the six screws (6) securely.
7. Carefully clean and replace the filter screen (5).
8. Replace the dome gasket (4) into the dome (3) and put this unit into position on the fuel head (7).
9. Replace the gasket (2) on the dome bolt (1) and insert in the hole in the dome (3) then tighten securely.
10. Replace fuel lines and tighten securely. Your pump is now in condition to give many long hours of additional service.

NOTE: The **LQ-30** or **LQ-30-A Repair Kit** and the parts included there-in, which are identified by an asterisk (*), are the only parts of the fuel pump available for service.

Ref. No.	Description	No. Req.
1	**PULSATOR DOME BOLT**	1
* 2	**DOME BOLT GASKET**	1
3	**PULSATOR DOME**	1
* 4	**DOME GASKET**	1
5	**FILTER SCREEN**	1
6	**SCREWS** for mounting fuel head	6
7	**FUEL HEAD**	1
* 8	**VALVE**	2
* 9	**VALVE SPRING** (7 coils)	2
10	**VALVE SPRING RETAINER**	1
*11	**VALVE PLATE GASKET**	1
12	**VALVE PLATE**	1
13	**SCREWS** for valve plate	3
*14	**DIAPHRAGM**—for Standard LP-38 Fuel Pump (LQ-30 Repair Kit) OR	1
	DIAPHRAGM—for Cold Weather, LP-38-C Fuel Pump (LQ-30-A Repair Kit)	1
*15	**DIAPHRAGM GASKET**	1
*16	**DIAPHRAGM SPRING**	1
*17	**ROCKER ARM SPRING**	1
18	**ROCKER ARM**	1
*19	**LINKAGE**	1
*20	**ROCKER ARM BUSHING**	1
*21	**ROCKER ARM PIN**	1
*22	**MOUNTING GASKET** (not illustrated)	1
23	**MOUNTING BRACKET**	1

IMPORTANT: **Always give Model, Specification and Serial Numbers as shown on name plate.**

FAIRBANKS-MORSE TYPE FM-XZE4B7-4 MAGNETO – WIS. MOTOR No. Y-98-C-S1
FOR MODEL MVG4D ENGINE PER MIL-E-11275-C SPECIFICATIONS



235655C-1

FIELD SERVICE AND ADJUSMENT INFORMATION

GENERAL DESCRIPTION

This magneto is a special unit designed and built for use on engines manufactured by the Wisconsin Motor Corporation. The magneto has the standard SAE flange mounting, but has a special coupling and drive gear arrangement.

The magneto has a feed thru condenser, which eliminates the necessity of a shielded ground wire and switch, when remote stopping is required. The positive action ground switch on the magneto is of the push button type, and is held in either an open or closed position by a coiled spring.

SERVICE PROCEDURE

Improper functioning of the magneto is often believed to be the cause of engine trouble arising from other sources. A brief engine inspection will often locate the trouble before the magneto is reached and prevent maladjustment of magneto parts in good condition. It is suggested that the magneto be opened only when it is certain that the magneto spark produced is unsatisfactory. This condition may be determined by a simple magneto spark test easily made in the field.

TESTING THE MAGNETO SPARK

Be sure the positive action ground switch is pulled out to open position before this test is made.

Remove the ignition cable from the No. 1 cylinder end cap tower and in its place insert a short piece of stiff wire. Bend this wire so it is not less than ¼" from the magneto housing or the engine block. Turn the engine over slowly and watch carefully for the spark which should occur at the instant the impulse coupling releases. Repeat this procedure with the remaining towers. If a strong spark is observed from all the towers, it is recommended that the magneto be eliminated as the source of the difficulty and that the cables, terminals, and spark plugs be thoroughly inspected. If a weak or no ignition spark is noted, check breaker point gap.

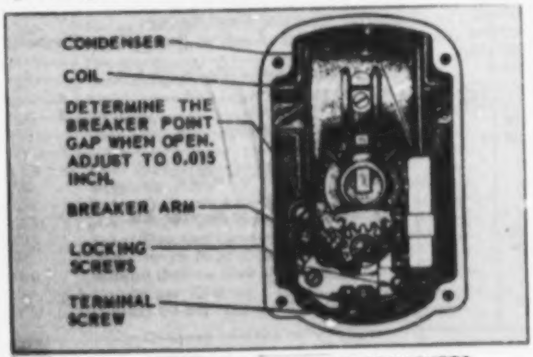

CONDENSER
COIL
DETERMINE THE BREAKER POINT GAP WHEN OPEN. ADJUST TO 0.015 INCH.
BREAKER ARM
LOCKING SCREWS
TERMINAL SCREW

Fig. 1. END VIEW OF TYPE FM-XZE4B7 MAGNETO

SERVICE OF BREAKER POINTS

The breaker points should be inspected for evidence of pitting or pyramiding. A small tungsten file or fine stone may be used to resurface the points. Badly worn or pitted points should be replaced. If it is necessary to resurface or replace the breaker points, it will also be necessary to readjust them to their proper clearance, which is 0.015 in. at full separation. This adjustment is made in the following manner: Be sure that the rubbing block is on the high point of the cam, to secure maximum separation of points. Loosen the locking screws identified in Fig. 1. Then, move the contact plate until the proper breaker point clearance is obtained. This is accomplished by means of a screw driver inserted in the adjusting slot at the bottom of the contact plate and pivoted between the two small bosses on the bearing support. Lock the assembly in place by tightening the locking screws and take a final measurement of the breaker point gap after the locking screws are tightened.

FURTHER FIELD SERVICE NOT RECOMMENDED

The felt wick, if very dirty or completely saturated with grease, should be replaced by a clean, dry wick. The cam, if dry, should be given a light coating of FMCO10 Magneto Grease. Other than this, the magnetos do not require field lubrication and any attempt to oil or grease the bearing is inadvisable. The lubricant should be renewed only during a complete overhaul of the magneto by a Factory-Authorized Magneto Service Station.

SEALING MAGNETO

Before replacing the end cap in the magneto frame, clean the contact surfaces between the cap and the frame. Place a new gasket in the joint, and mount the end cap on the frame, tightening the four screws securely.

SPECIAL DRIVE GEAR

The magneto is equipped with a special drive gear mounted directly on the impulse coupling. If it is necessary at any time to remove the drive gear, special care must be exercised in reassembly. Remove the engine end cap and turn the rotor until the contact segment is in firing position for No. 1 cylinder as shown in Fig. 2. With the distributor rotor in this position fit the gear to the impulse coupling lugs so that the prick punch mark on the rim of the gear is in the position shown in Fig. 2.

TIMING MAGNETO TO ENGINE

Refer to Magneto Timing instructions, in the front section of this manual, for proper timing of magneto to the engine.

GROUND SWITCH – Positive Action

The new ground switch assembly used on this magneto is of the push button type that stops the engine by grounding the primary circuit. The button is held in contact with the terminal screw by a spring mechanism, until the engine stops. The ground switch button is then pulled out to open the primary circuit, and remains in this position during the operating cycle, or until it is pushed in again. The switch must be hand actuated for starting or stopping the engine as it will remain in either position.

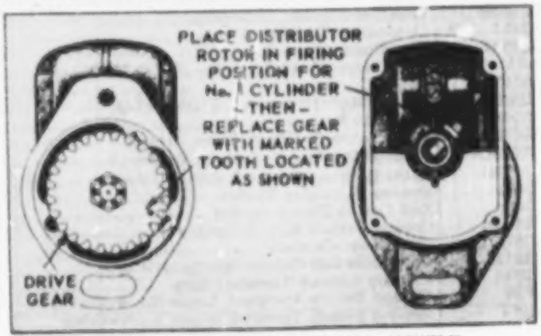
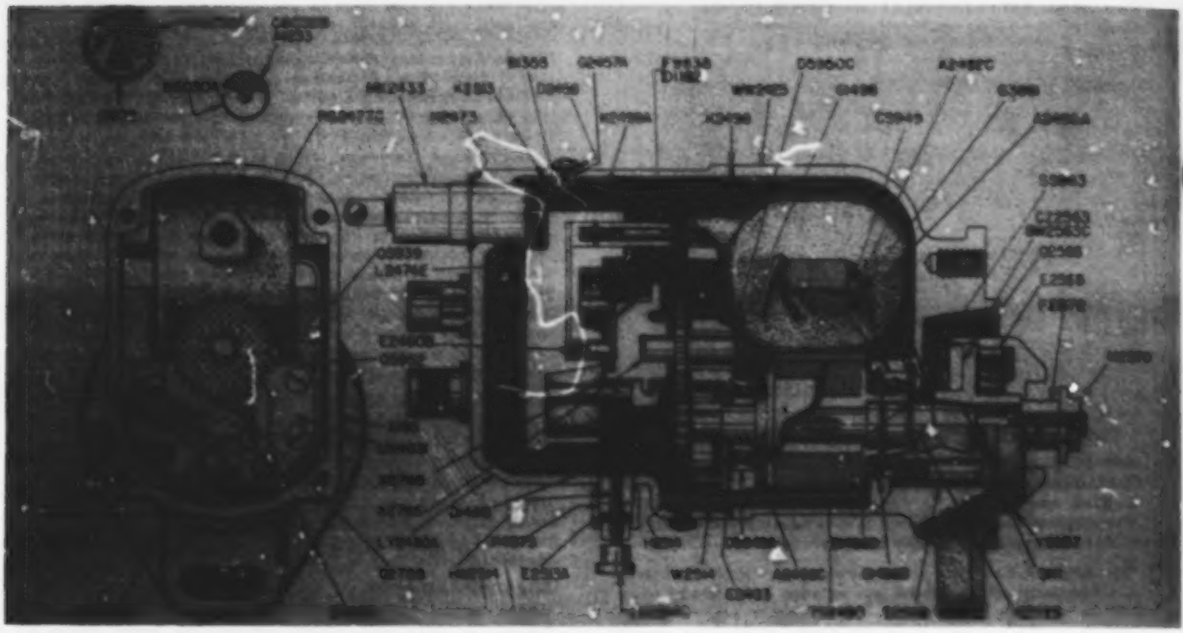

PLACE DISTRIBUTOR ROTOR IN FIRING POSITION FOR No. 1 CYLINDER – THEN – REPLACE GEAR WITH MARKED TOOTH LOCATED AS SHOWN
DRIVE GEAR

Fig. 2. DRIVE GEAR MARKING AND ASSEMBLY

best copy available

MAGNETO - FAIRBANKS-MORSE No. FM-XZE4B7, WISCONSIN MOTOR No. Y-98-C-S1
PER MIL-E-11275-C SPECIFICATIONS

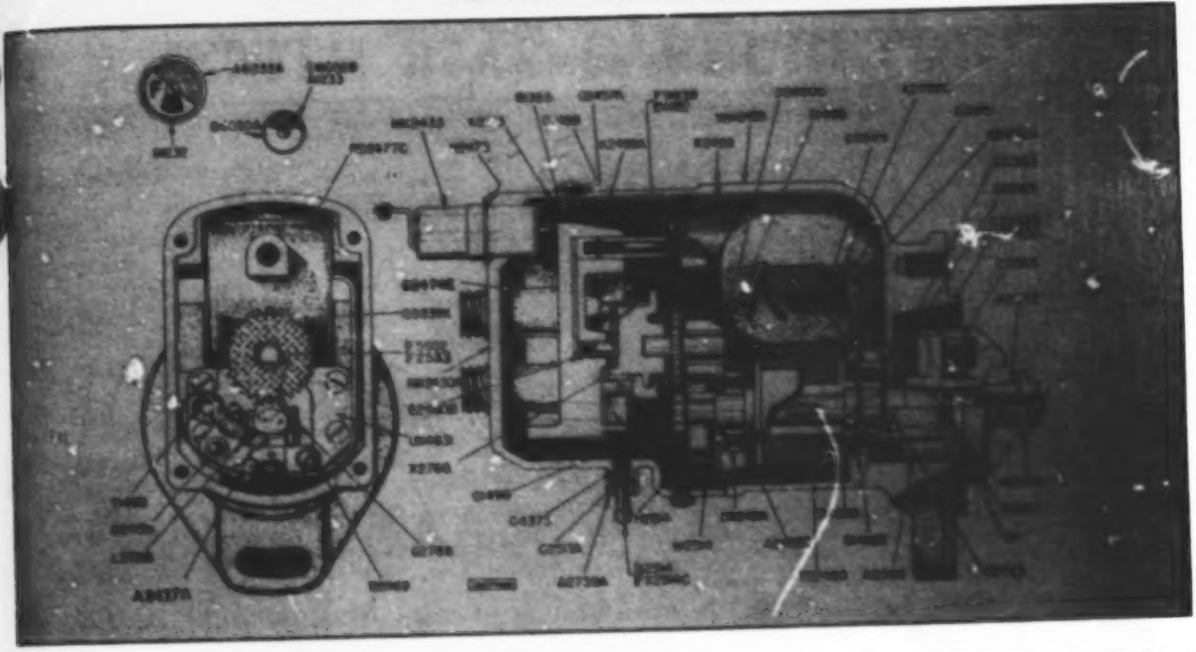


F-M Part No.		Description	No Req
F983B		High Tensior Lead	1
D1182		Suppressor Insulator	1
A1232		Vent Cover	2
686N		Vent Cover Screw No. 6-32x3/8	2
A1233		Vent Cover Copper Wool	4
B1355		Ground Strip Guide	1
D1498		Rotor Gear Snap Ring	1
G1498		Distributor Shaft Snap Ring	1
C1498G		Fulcrum Pin Snap Ring	1
B1498B		Rotor Drive End Bearing Snap Ring	1
B1498D		Rotor Drive End Shaft Snap Ring	1
WW2425		Housing	1
LY2430A		End Cap Assembly	1
10610D		End Cap Screw – No. 10-24X5/8	2
10818D		End Cap Screw – No. 10-24x1-1/8	2
MX2433	•	Feed-thru Condenser	1
686D		Condenser Mtg. Screw No. 6-32x3/8	2
A2437A	•	Breaker Arm Support Bracket and Points	1
686Z		Breaker Terminal Screw & Lockwasher No. 6-32x3/8	1
686U		Contact Support Locking Screw and Lock-washer No. 6-32x3/8	1
886U		Contact Support Locking Screw and Lock-washer No. 8-32x3/8	1
G2457A		Ground Switch Insulating Bushing	1
D2458		Contact Support Locking Screw Flat Washer	1
D2458		Ground Switch Screw Plate Washer	1
K2460B		Brush and Spring Assembly	1
H2473	•	Condenser 'O' Ring Seal	1
L2474E	•	Distributor Block	1
888D		Distributor Block Screws – No. 8-32x1/2	4
RS2477C		Coil	1
318814A		Coil Bridge Setscrew – 5/16-24x7/8"	2
T82480		Magnetic Rotor	1
A2492A		Rotor Drive End Seal Outer Washer	1
A2492C		Rotor Drive End Seal Inner Washer	1
A2492C		Rotor Bearing Grease Retaining Washer	1
K2483		Grease Retaining Washer	1
K2498		End Cap to Frame Gasket	1
K2499A		Ground Switch Wire Assembly	1
K2513		Condenser Contact	1
K2513A		Ground Switch Button Spring	1
H2514		Primary Ground Terminal Strip	1
688N		Ground Switch Terminal Screw No. 6-32x1/2.	2
6LW1		Ground Switch Terminal Screw Lockwasher	2

F-M Part No.		Description	No Req
6N1		Ground Switch Terminal Screw-Nut	2
W2514		Ground Switch to Contact Support	1
HW2514		Ground Switch Plunger, Nut and Button Assem.	1
LX2514C		Ground Switch Assembly Complete	1
CZ2563		Coupling Hub Assembly	1
BW2563C		Impulse Coupling Complete	1
E2565		Impulse Coupling Drive Spring	1
Q2566		Coupling Pawl	2
29-45		Pawl Snap Ring	2
S2568		Impulse Coupling Pawl Stop Pin	1
M2570		Impulse Coupling Nut	1
F2572		Impulse Coupling Bushing	1
C2723		Rotor Drive End Bearing Shim	2
X2765	•	Distributor Rotor	1
A2766		Distributor Rotor Spring Clip	1
G2788		Cam Wick and Holder	1
G3861		Rotor Drive End Seal	1
F4373		Ground Switch Spacer	1
UX4631		Bearing Support	1
886G		Bearing Support Screw – No. 8-32x3/8	4
Q5939		Distributor Gear Assembly	1
C5949		Rotor Drive End Bearing	1
D5949A		Rotor Cam End Bearing	1
D5950C		Distributor Bearing	1
Q5852		Rotor Gear	1
Y5957		Impulse Coupling Shell	1
S5963		Impulse Coupling Pawl Spring	2
B5969		Contact Support Locking Screw Plate Washer	1
B6030A		Vent Cover	2
684L		Vent Cover Screw – No. 6-32x1/4	2
A6032A		Vent Cover Screen	2
C6032B		Vent Cover Screen	2
3K1		Key (Rotor to Impulse Coupling)	1
SK90		Service Kit (2920-997-1454)	1

- Parts Included in Service Kit.

MAGNETO- FAIRBANKS-MORSE No. FM-XZE4B7, WISCONSIN MOTOR No. Y-98-A-S1
PER MIL-E-11275-B SPECIFICATIONS



F-M Part No.		Description	No Req
F983B		High Tension Lead	1
D1182		Suppressor Insulator	1
B1232		Vent Cover	2
686N		Vent Cover Screw No. 6-32x3/8	2
A1233		Vent Cover Copper Wool	4
B1355		Ground Strip Guide	1
D1498		Rotor Gear Snap Ring	1
G1498		Distributor Shaft Snap Ring	1
T1498		Fulcrum Pin Snap Ring	1
V1498		Ground Switch Button Snap Ring	1
B1498B		Rotor Drive End Bearing Snap Ring	1
C1498D		Rotor Drive End Shaft Snap Ring	1
E2303		Oil Slinger Baffle Disc	1
WW2425		Frame	1
NX2430A		End Cap	1
10810D		End Cap Screw – No. 10-24x5/8	2
10818D		End Cap Screw – No. 10-24x1-1/8	2
MX2433	•	Feed-thru Condenser	1
696D		Condenser Mtg. Screw No. 6-32x3/8	2
A2437A	•	Breaker Arm Support Bracket and Points	1
686U		Breaker Terminal Screw & Lockwasher No. 6-32x3/8	1
686U		Contact Support Locking Screw and Lockwasher No. 6-32x3/8	2
856U		Contact Support Locking Screw and Lockwasher No. 8-32x3/8	1
G2457A		Ground Switch Insulating Bushing	1
D2458		Contact Support Locking Screw Flat Washer	1
D2458		Ground Switch Screw Plate Washer	1
E2460B		Brush and Spring Assembly	1
H2473	•	Condenser 'O' Ring Seal	1
G2474E	•	Distributor Block	1
898D		Distributor Block Screws – No. 8-32x1/2	4
RS2477C		Coil	1
25S814A		Coil Bridge Setscrew 1/4-20x7/8	2
TS2480		Magnetic Rotor	1
A2492A		Rotor Drive End Seal Outer Washer	1
A2492C		Rotor Drive End Seal Inner Washer	1
A2492C		Rotor Bearing Grease Retaining Washer	1
K2498		End Cap to Frame Gasket	1
K2499A		Ground Switch Wire Assembly	1
K2513		Condenser Contact	1
C2513A		Ground Switch Button Spring	1

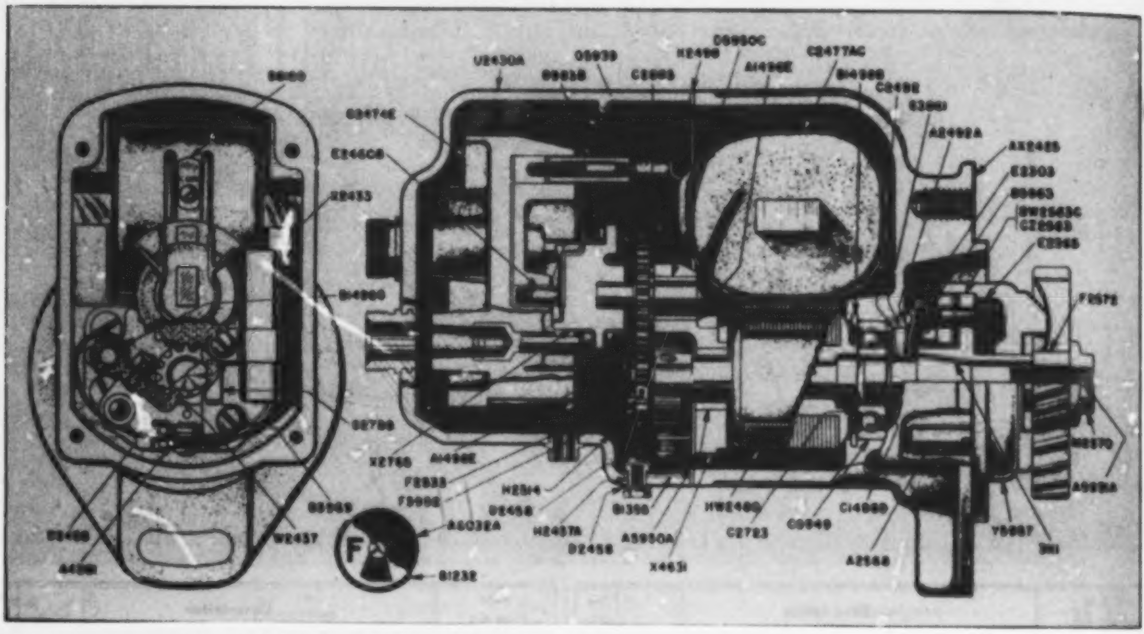
F-M Part No.		Description	No Req
H2514		Primary Ground Terminal Strip	1
6S8N		Ground Switch Terminal Screw No. 6-32x1/2	2
6LW1		Ground Switch Terminal Screw Lockwasher	2
6N1		Ground Switch Terminal Screw-Nut	2
S2514		Ground Switch Push Button	1
W2514		Ground Switch to Contact Support	1
FX2514C		Push Button Ground Switch Assembly	1
F2533		Rotor Gear Pin	1
CZ2563		Coupling Hub Assembly	1
BW2563C		Impulse Coupling Complete	1
E2565		Impulse Coupling Drive Spring	1
A2568		Impulse Coupling Pawl Stop Pin	1
M2570		Impulse Coupling Nut	1
A2572		Impulse Coupling Bushing	1
C2723		Rotor Drive End Bearing Shim	1
A2735A		Ground Switch Nut	1
X2765	•	Distributor Rotor	1
G2788		Cam Wick and Holder	1
L2788		Breaker Arm Wick	1
G3861		Rotor Drive End Seal	1
C4373		Ground Switch Bushing	1
UX4631		Bearing Support	4
856G		Bearing Support Screw – No. 8-32x3/8	1
Q5939		Distributor Gear	1
C5949		Rotor Drive End Bearing	1
D5949A		Rotor Cam End Bearing	1
D5950C		Distributor Bearing	1
F5952		Rotor Gear	1
Y5957		Impulse Coupling Shell	1
B5963		Impulse Coupling Pawl Spring	1
B5969		Contact Support Locking Screw Plate Washer	2
B6030A		Vent Cover	2
6S5N		Vent Cover Screw – No. 6-32x5/16	2
A6032A		Vent Cover Screen	2
C6032B		Vent Cover Screen	1
3K1		Key (Rotor to Impulse Coupling)	1
GK22		Gasket Kit	1
SK45		Service Kit	

• Parts Included in Service Kit.

PARTS LIST
FOR FAIRBANKS-MORSE TYPE FM-XE4B7 MAGNETO

PER MIL-E-11275-A SPECIFICATIONS

WISCONSIN MOTOR No. Y-98-S1


U2430A
Q5939
D5950C
K2498
A1498E
C2477AC
B1498B
G2474E
E2460B
X2433
B1498G
A2492A
AX2425
E2303
B5963
BW2563C
CZ2563
E2565
F2572
G2788
X2765
A1498E
F2533
F5952
A6032A
B1232
H2514
D2458
H2457A
D2458
B1355
A5950A
X4631
HW2480
C2723
C5949
C1498D
A2568
Y5957
3K1
M2570
A5931A
B5969
W2437
D2458
A4361
F

NOTE: Part numbers shown are Fairbanks-Morse Part Numbers.

Part Number	Description	No. Req.
B983B	High Tension Lead and Suppressor	1
B1232	Vent Hood	2
6S6N	Vent Hood Screw	2
B1355	Primary Ground Strip Guide	1
A1498E	Magnetic Rotor Gear Snap Ring	1
A1498E	Distributor Shaft Snap Ring	1
B1498B	Rotor Drive End Bearing Snap Ring	1
B1498G	Fulcrum Pin Snap Ring	1
C1498D	Rotor Drive End Shaft Snap Ring	1
E2303	Oil Slinger Baffle Disc	1
AX2425	Frame	1
U2430A	End Cap and Vent Assembly	1
10S10D	End Cap Screw (No. 10-24x5/8")	2
10S18D	End Cap Screw (No. 10-24x1-1/8")	2
X2433	Condenser Assembly	1
6S4U	Condenser Mounting Screw (No. 6-32x¼")	1
W2437	Breaker Arm Support Bracket & Points	1
6S5N	Breaker Arm Terminal Screw	1
6LW2	Breaker Arm Terminal Screw Lockwasher (No. 6)	1
6S6N	Contact Support Locking Screw (No. 6-32x3/8")	1
6LW2	Contact Support Locking Screw Lockwasher (No. 6)	1
8S6N	Contact Support Locking Screw (No. 8-32x3/8")	1
8LW3	Contact Support Locking Screw Lockwasher (No. 8)	1
H2457A	Primary Ground Terminal Bushing	1
D2458	Contact Support Locking Screw Washer	1
D2458	Primary Ground Washer	2
E2460B	Coil Lead Brush and Spring	1
G2474E	Distributor Block	1
8S8D	Distributor Block Screw (No. 8-32x½")	4
C2477AC	Coil (Inc. B6120, 6S3N)	1
25SS14A	Coil Bridge Setscrew (¼-20x7/8")	2
HW2480	Magnetic Rotor Assembly	1
A2492A	Rotor Drive End Seal Outer Washer	1
C2492	Rotor Drive End Seal Inner Washer	1

Part Number	Description	No. Req.
K2498	End Cap to Frame Gasket	1
H2514	Primary Ground Strip	1
6S8N	Primary Ground Screw (No. 6-32x½")	1
6N1	Primary Ground Nut (No. 6-32)	1
6LW1	Primary Ground Nut Lockwasher (No. 6)	1
F2533	Magnetic Rotor Gear Pin	1
BW2563C	Impulse Coupling (UB40, CW, 25°-30° lag) (BW2563C inc. CZ2563, E2565, Y5957)	1
CZ2563	Impulse Coupling Hub (CW, 25°-30° lag) (CZ2563 inc. B5963)	1
E2565	Impulse Coupling Drive Spring	1
A2568	Impulse Coupling Pawl Stop Pin	1
M2570	Impulse Coupling Nut	1
F2572	Drive Gear Bushing	1
C2665	Distributor Gear Thrust Washer	1
C2723	Rotor Drive End Bearing Shim (as needed)	2
X2765	Distributor Rotor	1
G2788	Cam and Wick Holder Assembly	1
G3861	Magnetic Rotor Drive End Seal	1
A4361	Primary Wire Terminal for No. 8 Screw	2
X4631	Bearing Support Assembly	1
8S8G	Bearing Support Screw (No. 8-32x3/8")	4
A5931A	Impulse Coupling Lockwire	1
Q5939	Distributor Shaft and Gear Assembly	1
C5949	Magnetic Rotor Drive End Bearing	1
A5950A	Magnetic Rotor Bearing (Opp. Drive End)	1
D5950C	Distributor Bearing	1
F5952	Magnetic Rotor Gear	1
Y5957	Impulse Coupling Shell	1
B5963	Impulse Coupling Hub Pawl Spring	2
B5969	Contact Support Locking Screw Washer	1
A6032A	Vent Screen	2
B6120	Coil Clip	1
6S3N	Coil Clip Screw (No. 6-32x3/16")	1
3K1	Key (Rotor to Impulse Coupling)	1

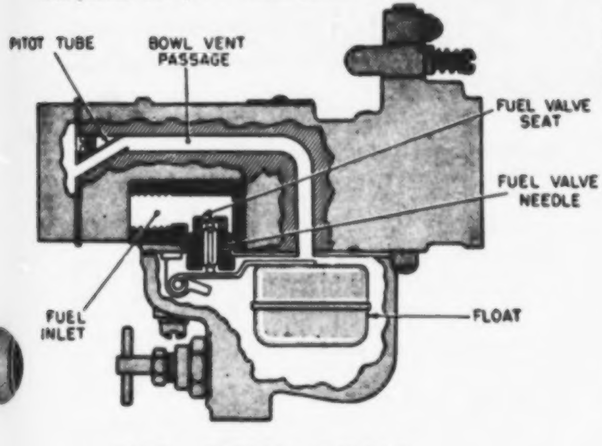
ZENITH 87A8 CARBURETOR

FOR WISCONSIN MOTOR CORPORATION

The Zenith 87-Series is a horizontal carburetor with a concentric fuel bowl. It is a "balanced" carburetor, because all air for fuel chamber and metering well ventilation and idling must come through the air cleaner. Air cleaner restrictions have a minimum influence on the fuel-air ratio when a carburetor is thus "balanced".

The main jet and discharge jet are centrally located. The metering well which completely surrounds the discharge jet is in the center of the fuel bowl assembly. This construction permits extremely high angle operation in any direction.

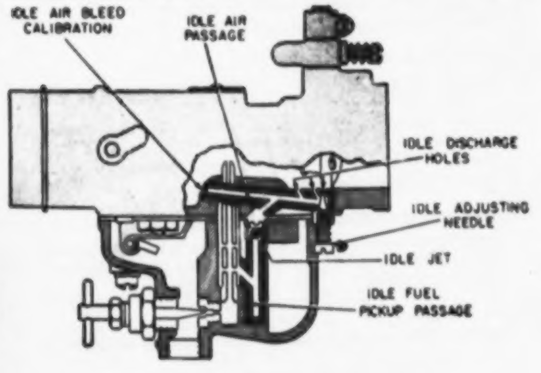
The venturi, which is part of the throttle body casting, measures the volume of air that passes through the carburetor. In selecting the venturi size, the smallest size that will permit full power development should be used.



FUEL SUPPLY SYSTEM

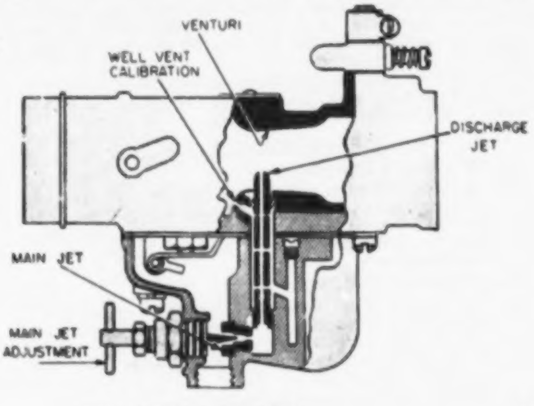
FUEL SUPPLY SYSTEM. Fuel under normal pressure entering the float chamber through the fuel valve seat is controlled by the twin float which, moving on its axle, closes the needle valve when the fuel reaches the proper level in the bowl.

IDLING SYSTEM. At idling speeds the throttle plate is almost closed, thus a very high suction exists at the edge of the throttle plate. At this point the idle discharge orifices are located. All fuel for idling and part throttle operation is supplied through the main jet. Fuel from the float chamber flows through the main jet into the metering well. Fuel for idling is drawn from this well through the calibration, or metering orifice, in the center of the idling jet. As the fuel reaches the idling channel it is mixed with air which is admitted through a calibrated orifice in the channel from the inside of the air intake to form an emulsion. This emulsion is discharged into the air stream, to form the idling mixture, through two holes, one of which is controlled by the idle adjusting needle. Turning the adjusting needle counter-clockwise (out) permits more of the emulsion to reach the air stream and make the idling mixture richer while turning the needle in (clockwise) cuts off the amount of the emulsion reaching the air stream and makes the mixture leaner.



IDLE SYSTEM

HIGH SPEED SYSTEM. As the throttle is opened, the suction on the idling system diminishes, but the increased volume of air entering the engine through the venturi creates sufficient vacuum (suction) on the discharge jet to draw an emulsion of fuel and air from the metering well which receives its fuel from the main jet and its air from the well vent. The flow characteristics of the discharge jet are influenced by the size, location, and number of holes in the sides of that part of the jet which is in the metering well, as well as by the sizes of the discharge jet orifice, the size of the main jet, and the size of the well vent. The well vent is located in the air intake and permits air to enter the top of the metering well around the outside of the discharge jet. The flow of fuel through the main jet is controlled by the main jet adjustment.



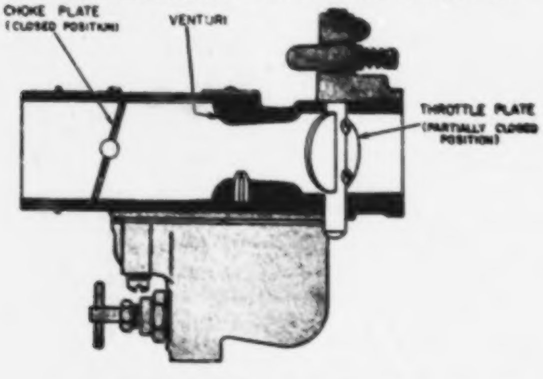
HIGH SPEED SYSTEM

CHOKE SYSTEM. Starting a cold engine requires a much richer mixture of fuel and air. Moving the choke lever to close the choke plate restricts the air entering the carburetor, except at the pitot tube to the bowl vent, and increases the suction on the idling system which makes the mixture richer.

STARTING THE ENGINE. Before cranking the engine, the carburetor throttle should be opened a little to expose both idle discharge ports to suction. The choke should be fully closed until the engine starts, then opened a little to prevent stalling from being over-choked, then when the engine is fully warmed up the choke can be returned to wide open position and the throttle closed to the idling position.

ADJUSTMENTS. Adjust the throttle stop screw to obtain the desired idling speed by turning the screw in (clockwise) to increase the speed and out (counter-clockwise) to decrease the engine speed.

Adjust the idle adjusting needle to obtain smooth idling of the engine at idling speed. Turn the needle out (counter-clockwise) to make the mixture richer, and in (clockwise) to make it leaner.


CHOKE PLATE (CLOSED POSITION)
VENTURI
THROTTLE PLATE (PARTIALLY CLOSED POSITION)

CHOKE SYSTEM

Adjust the main jet adjustment for full power of the engine while under a load. Turning the adjusting needle out (counter-clockwise) makes the mixture richer while turning the needle in (clockwise) cuts off the flow of fuel to make the mixture leaner.

NOTE: Do not try to operate on a very lean mixture; better performance and better fuel economy will be obtained if the mixture is not too lean.

DISASSEMBLY

A. IDENTIFY CARBURETOR

(a) Check numbers on metal identification disk riveted to top of throttle body. The inside number next to the rivet is the Zenith assembly number and the one next to the outer edge of the disk is the vehicle manufacturer's.

B. DISASSEMBLED VIEWS

(a) The disassembled view will identify the various component parts and show the relation to assembly. Use the disassembled view to identify and locate parts when performing the disassembly and reassembly operations.

C. SEPARATE CARBURETOR BODIES

(a) Remove the three bowl assembly screws (45 & 46) and separate fuel bowl (39) from throttle body (26).

D. DISASSEMBLE FUEL BOWL

(a) Remove the main jet adjustment (43) and fibre washer (42), using a $\frac{9}{16}$" open end wrench.
(b) Remove the main jet (41) and fibre washer (40), using Zenith Tool No. C161-83 main jet wrench.
(c) Remove the Idle Jet (38), using a small screwdriver.
(d) Remove the bowl drain plug (44).

E. DISASSEMBLE THROTTLE BODY

(a) Remove the float axle (35) by pressing against the end with the blade of a screwdriver.
(b) Remove the float (36).
(c) Remove the fuel valve needle (31), using the fingers.
(d) Remove the fuel bowl to throttle body gasket (37).
(e) Remove the main discharge jet (32), using a small screwdriver.
(f) Remove the fuel valve seat (31) and fibre washer (30), using Zenith Tool No. C161-85.
(g) Remove the idle adjusting needle (17) and spring (18).

CLEAN AND INSPECT PARTS

A. CLEAN PARTS

(a) Clean all metal parts thoroughly with cleaning solution and rinse in solvent.
(b) Blow out all passages in the air intake assembly, fuel bowl assembly and throttle body. NOTE: Be sure all carbon deposits have been removed from throttle bore and idle discharge holes. It is advisable to reverse flow of compressed air in all passages to insure all dirt has been removed. Never use a wire or drill to clean out jets.

B. INSPECT PARTS

(a) **Float Assembly.** Replace float assembly if loaded with gasoline, damaged, or if float axle bearing is worn excessively. Inspect top side of float lever for wear where it contacts fuel valve needle.
(b) **Float Axle.** Replace if any wear can be visually detected on the bearing surface.
(c) **Fuel Valve Seat & Needle Assembly.** Replace fuel valve seat and needle because both parts wear and may cause improper float level.
(d) **Idling Adjusting Needle and Spring.** Inspect point of needle. This must be smooth and free of ridges.
(e) **Gaskets and Fibre Washers.** Replace all gaskets and fibre washers every time the carburetor is disassembled.
(f) **Check Specifications.** Verify the correctness of the following parts. Numbers will be found on the parts. **Venturi; Main Jet; Idling Jet; and Fuel Valve Seat.**

REASSEMBLY

A. REASSEMBLE THROTTLE BODY

(a) Install the fuel valve seat (31) and fibre washer (30), using Zenith Tool No. C161-85.
(b) Install the main discharge jet (32), using a small screwdriver.
(c) Install fuel valve needle in seat (31), followed by float (36) and float axle (35). NOTE: Insert tapered end of float axle (35) into float bracket on side opposite slot and push through the other side. Press float axle (35) into slotted side until the axle is centered in bracket.
(d) Fuel Level. Check position of float assembly (36) for correct measurement to obtain proper fuel level using a depth gage. NOTE: Do not bend, twist, or apply pressure on the float body.
With bowl cover assembly (26) in an inverted position, viewed from free end of float (36), the float body must be centered and at right angles to the machined surface. The float setting is measured from the machined surface (no gasket) of float bowl cover to top side of float body at highest point. This measurement should be $\frac{11}{16}$", plus or minus $\frac{1}{16}$".
(e) **Bending Float Lever.** To increase or decrease distance between float body (36) and machined surface (26) use long nosed pliers and bend lever close to float body.
NOTE: Replace with new float if position is off more than $\frac{1}{16}$".
(f) Install throttle body to fuel bowl assembly gasket (37) on machined surface of throttle body (26).
(g) Install the idle adjusting needle (17) and spring (18).

B. REASSEMBLE FUEL BOWL

(a) Install the main jet (41) and fibre washer (40), using Zenith Tool No. C161-83 main jet wrench.
(b) Install the main jet adjustment (43) and fibre washer (42), using a $\frac{9}{16}$" open end wrench.
(c) Install the idle jet (38), using a small screwdriver.
(d) Install the bowl drain plug (44).

C. REASSEMBLE CARBURETOR BODIES

(a) Install the three bowl assembly screws (45 & 46) through the fuel bowl and into the throttle body and draw down firmly and evenly.

SPECIAL TOOLS

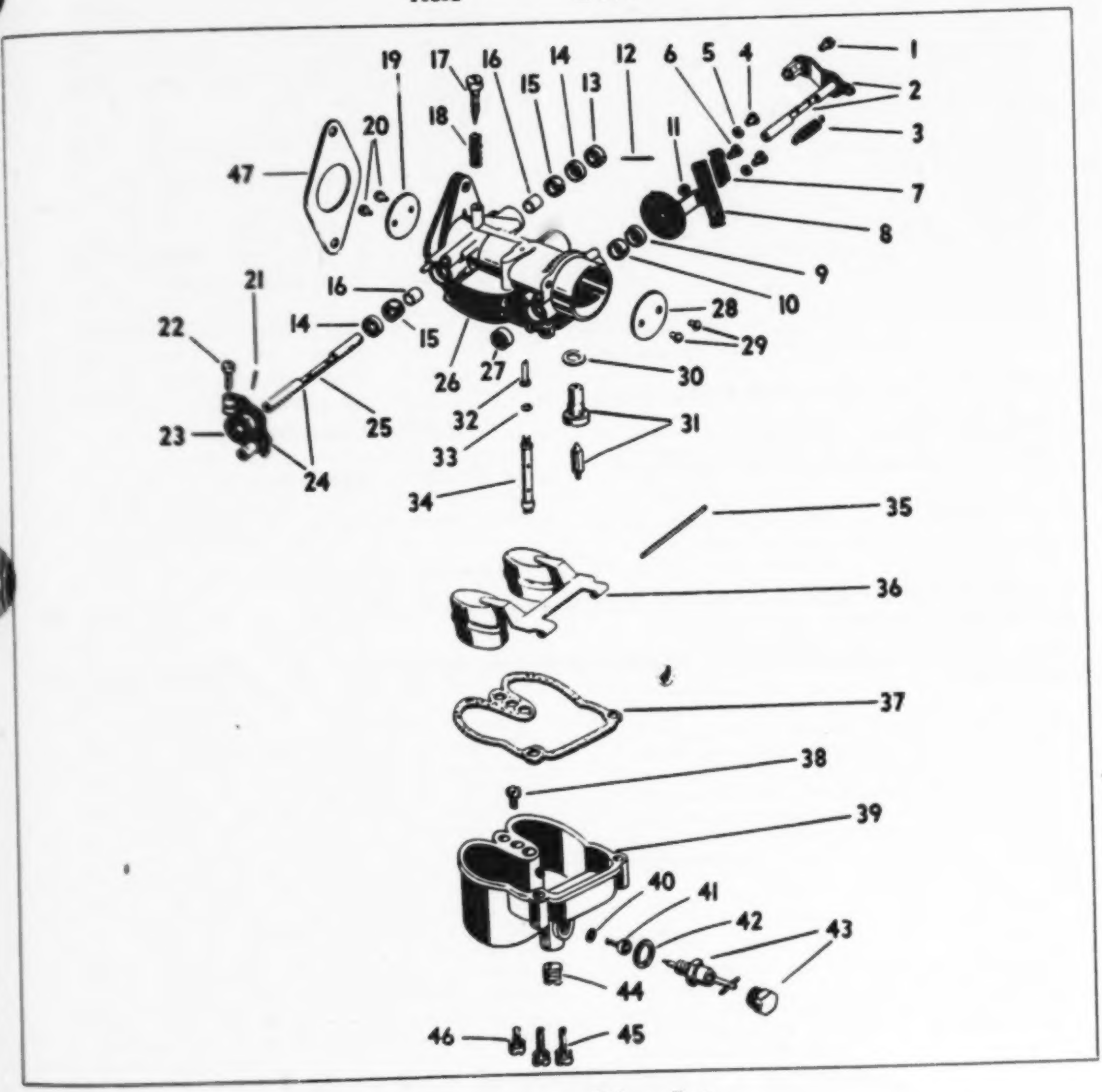
The special tools recommended for the 87-Series carburetors are:

1. C161-83 Main Jet Wrench.
2. C161-85 Fuel Valve Seat Wrench.

Parts List for Model 87A8 Zenith Carburetor

(FOR WISCONSIN MOTOR CORP.)

ZENITH No.	WISCONSIN No.
11532	L-57-1


19
17
16
14
12
6
5
4
1
2
3
15
13
18
20
11
47
7
8
9
10
21
16
14
15
22
28
29
26
27
30
23
25
24
32
33
31
34
35
36
37
38
39
40
41
42
43
44
46
45

Ref. No.	Part No.	Part Name
1	T8S8-6	Screw—Lever Swivel
2	C108-130	Shaft and Lever—Choke
3	C112-6	Spring—Choke Lever
4	C140-58	Screw—Bracket Assembly
5	T41-8	Lockwasher—Bracket Screw
6	T1S8-8	Screw—Tube Clamp
7	C110-7	Clamp—Bracket Tube
8	C109-60	Bracket—Choke
9	C131-4x2	Retainer—Choke Shaft Packing
10	CT57-4	Washer—Choke Shaft Packing

Ref. No.	Part No.	Part Name
11	T21S8	Nut—Clamp Screw
12	†CT63-9	Taper Pin—Thrust Washer
13	†C130-4	Washer—Shaft Thrust
14	CT52-53	Retainer—Throttle Shaft Packing
15	CT48-9	Washer—Throttle Shaft Packing
16	C9-72	Bushing—Throttle Shaft
17	†C46-49	Needle—Idle Adjusting
18	C111-155	Spring—Adjusting Needle
19	C21-42	Plate—Throttle
20	†T315B5-3	Screw—Throttle Plate
21	CT63-9	Taper Pin—Throttle Lever
22	T1S8-10	Screw—Lever Stop
23	CR27-241	Lever and Stop—Throttle
24	C29-1037	Shaft and Lever—Throttle (Items 21, 22, 23, 25)
25	C23-533	Shaft—Throttle
26		Body—Throttle. Not serviceable. Purchase complete carburetor.
27	CR37-1x1	Plug—Choke Shaft Hole
28	C102-113	Plate—Choke
29	†T315B5-3	Screw—Choke Plate
30	T56-20	Fiber Washer—Fuel Valve Seat

Ref. No.	Part No.	Part Name
31	†C81-17-35	Valve and Seat—Fuel
32	C66-104-42	Jet—Discharge
33	†T56-73	Fiber Washer—Well
34	C76-50-1	Well—Metering
35	†C120-18	Axle—Float
36	C85-97	Float
37	†C142-55	Gasket—Bowl to Body
38	†C52-2-12	Jet—Idle
39	B3-98A	Bowl—Fuel
40	†T56-24	Fiber Washer—Main Jet
41	†C52-7-38	Jet—Main
42	†T56-23	Fiber Washer—Passage Plug
43	C138-23	Plug—Main Passage
44	CT91-5	Plug—⅛" Pipe (Bowl Drain)
45	†T301S8-14	Screw—Bowl to Body (Long)
46	T301S8-9	Screw—Bowl to Body (Short)
47	†C141-4-6	Gasket—Flange
	C181-296	Gasket Set
	K-11532	Repair Kit

† Parts Included in Repair Kit.

The Idle Air Bleed Bushing and Well Vent Bushing are calibrated parts of the Throttle Body (item 26) and are not readily removable.

Zenith service parts can be obtained promptly through our central and service distributors located in principal cities.

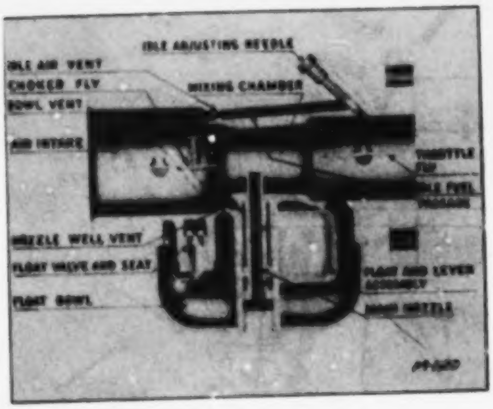
* * *

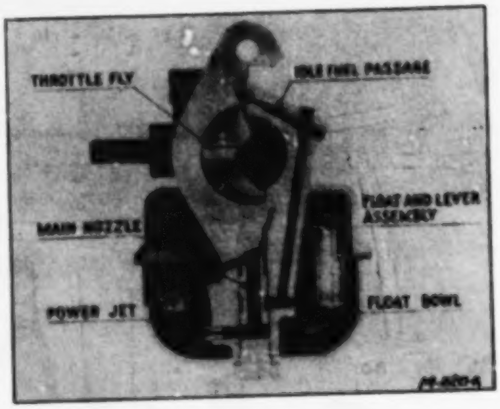
ZENITH CARBURETOR DIVISION

696 HART AVENUE DETROIT 14, MICHIGAN
AVIATION CORPORATION
Manufacturers of Zenith Carburetors and Filters

MARVEL-SCHEBLER CARBURETER

FOR WISCONSIN MODEL MVG4D ENGINE





DESCRIPTION

1. The Model VH-69-A (Wis. No. L-54-J-1) is a float type carburetor with idle fuel adjustment designed for use with the Model MVG4D Wisconsin Air Cooled gasoline engine, and is made up of two major units—a die cast aluminum throttle body and a stamped steel fuel bowl.
2. The model number is stamped on a square boss, provided for it on the body casting.

OPERATION

With the throttle fly slightly open from the closed position to permit idling, the main fuel nozzle may be delivering little or no fuel, as only a very small quantity of air passes through the mixing chamber at this time. An idle passage is provided to carry sufficient air and fuel to the engine side of the throttle fly where the suction is high. This passage takes the air from the inlet side of the venturi to the intersection of the vertical idle fuel passage (which connects with the main nozzle assembly) and delivers the air-fuel mixture through an opening controlled by the idle adjusting needle to the throttle barrel just beyond or on the engine side of the throttle fly. The idle system is practically independent of the main nozzle system, and only controls the fuel metering at low engine speed. As air-flow increases with the opening of the throttle fly the main nozzle begins to deliver fuel, and the delivery from the idle system decreases until at full throttle, delivery is entirely from the main nozzle.

ADJUSTING CARBURETOR

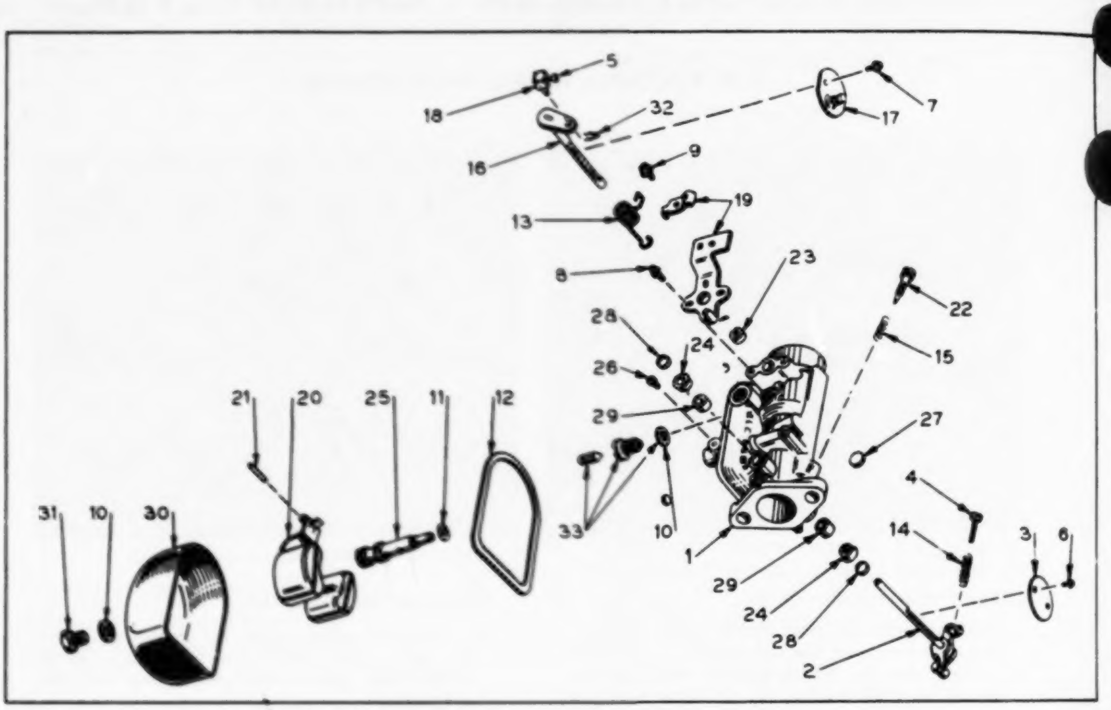
1. To start the engine, close the choker fly. When the engine starts, open choker to the proper warm-up position. After engine has warmed up, open choker fully.
2. Close the throttle and adjust the throttle stop screw to give the proper idle speed. The idle adjusting needle should be in proper adjustment at about ¾ to 1 turn open. Turn the idle adjusting needle open until engine rolls from "richness". Then turn the needle towards the seat until the engine runs irregularly from "leanness". From the "lean" setting, open the idle adjusting needle to the richest mixture that will not cause the engine to "roll" or run unevenly. This adjustment will, in most cases, give a slower idling speed than a slightly leaner adjustment with the same throttle stop screw setting, but will give the smoothest idle operation. After the idle adjusting needle setting has been made, it may be necessary to revise the throttle stop screw setting to give the proper idling speed.

CAUTION:

Care should be taken not to damage the idle adjusting needle nor its seat by turning the idle adjusting needle too tightly against the seat, as damage to either of these parts will make a satisfactory idle adjustment very difficult.

MARVEL-SCHEBLER CARBURETOR DIVISION, BORG-WARNER CORPORATION
DECATUR, ILL., U. S. A.

PARTS LIST
FOR MARVEL-SCHEBLER CARBURETOR



NOTE: Part numbers shown are Marvel-Schebler Part Numbers.

Ref. No.	Part Number	Part Name - Description
1	10-3774	Carburetor Assembly – Complete
2	13-956	Throttle Shaft Assembly
3	14-214	Throttle Fly
4	15-42	Screw (No. 8-32 x ⅝" Fillister Head) (Throttle Stop)
5	15-285	Screw (No. 8-32 x 5/16" Fill. Head) (Choke Swivel)
6	15-A46	Screw (No. 4-40 x ¼" Sems) (Throttle Fly)
7	15-A47	Screw (No. 4-40 x 3/16" Sems) (Choke Fly)
8	15-A93	Screw (No. 8-32 x 3/8" Fillister Head) (Sems) (Choke Bracket)
9	15-A99	Screw (No. 8-32 x 5/16" Sems) (Choke Bracket Clip)
10	16-4	Gasket (Bowl Plug – 1) (Float Valve Seat – 1)
11	16-456	Gasket (Nozzle)
12	16-A105	Gasket (Bowl)
13	24-213	Spring (Choke Return)
14	24-262	Spring (Throttle Adj.)
15	24-485	Spring (Idle Adjusting Needle)
16	26-720	Choke Shaft Assembly
17	27-559	Choke Fly Assembly
18	28-49	Choke Swivel
19	29-537	Choker Bracket Assembly
20	30-666	Float and Lever Assembly
21	32-27	Float Lever Shaft
22	43-129	Idle Adjusting Needle
23	44-38	Packing (Choke Shaft)
24	44-63	Packing (Throttle Shaft)
25	47-395	Main Nozzle
26	49-253	Power Jet
27	55-230	Cup (Choke Shaft)
28	55-231	Packing Retainer (Throttle Shaft)
29	60-439	Bushing (Throttle Shaft)
30	65-172	Fuel Bowl
31	80-166	Plug–Bowl Retaining
32	82-16	Cotter (Choke Swivel)
33	233-536	Matched Float Valve, Seat and Gasket Assembly
	286-776	Package Repair Kit
	16-649	Gasket Assortment

APPENDIX C

HYDRAULIC PUMP MAINTENANCE INSTRUCTIONS

introduction

The Weatherhead Variable Delivery Hydraulic Pump described in this manual is a positive displacement, in-line, axial piston type unit. Only two rotating parts are associated with the principal functional mechanism — the drive shaft and the cam. Fluid is pumped by seven pistons reciprocating in a non-rotating cylinder block. Individual discharge check valves are connected to each pumping cylinder. A wide range of control options is offered.

(See page C-5 for information.)

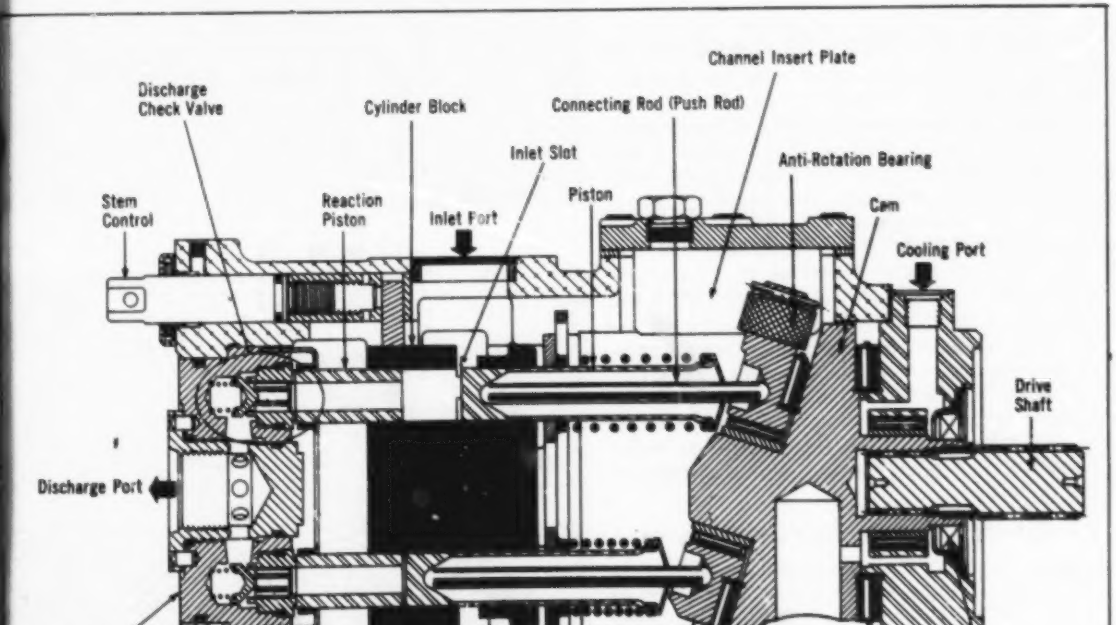
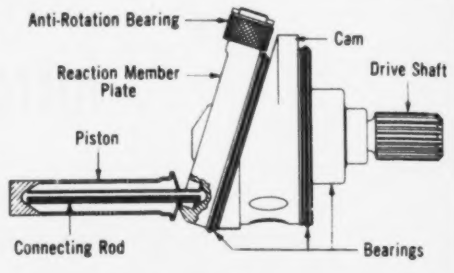

Channel Insert Plate
Discharge Check Valve
Cylinder Block
Connecting Rod (Push Rod)
Inlet Slot
Anti-Rotation Bearing
Stem Control
Reaction Piston
Inlet Port
Piston
Cam
Cooling Port
Drive Shaft
Discharge Port
Outlet Manifold
Housing
Reaction Member Plate
Shaft Seal

Figure 1 — Weatherhead Variable Displacement Pump

section Ⓑ DESCRIPTION

1 DRIVE GROUP (Figure 2)

The fixed angle cam converts the rotary input of the drive shaft to an oscillating motion of the reaction member plate. The reaction member plate is prevented from rotating by an anti-rotation bearing which oscillates in a channel parallel to the axis of the pump. This permits the reaction member to impart a reciprocating motion to the pistons through long, self-aligning connecting rods (push rods).

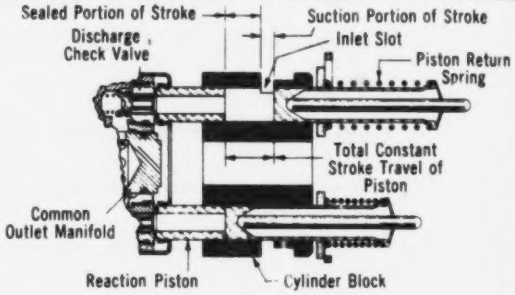


Anti-Rotation Bearing
Cam
Reaction Member Plate
Drive Shaft
Piston
Connecting Rod
Bearings

Figure 2 — Drive Group

2 PUMPING GROUP (Figure 3)

Fluid is discharged from the cylinder during the sealed portion of the piston stroke as it advances in the cylinder bore. This fluid is instantaneously trapped until sufficient pressure force is developed to cause the discharge check valve to open. The fluid is discharged through a passage in the reaction piston and the check valve to the common outlet manifold. The piston return force is supplied by a piston return spring. The return stroke of the piston creates a partial vacuum in the cylinder during the sealed portion of travel. The pressure differential thus developed, between the fluid contained in the pump housing and the cylinder, forces fluid to enter the cylinder when the inlet slot is uncovered by the piston.



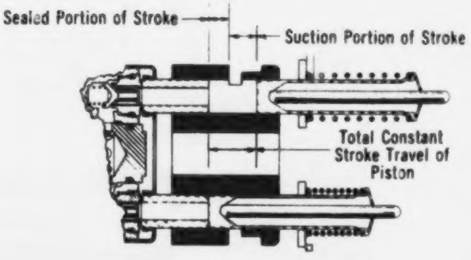
Sealed Portion of Stroke
Suction Portion of Stroke
Discharge Check Valve
Inlet Slot
Piston Return Spring
Total Constant Stroke Travel of Piston
Common Outlet Manifold
Reaction Piston
Cylinder Block

Figure 3 — Pumping Group

3 VARIABLE DELIVERY (Figures 3 and 4)

The volume of fluid delivered may be infinitely varied from zero to maximum at any drive speed. The delivery may be varied manually, automatically, or by remote command signal. The change in delivery rate is accomplished by adjusting the axial location of the cylinder block. This has the effect of increasing or decreasing the effective stroke (sealed portion of the stroke) of the piston. The piston has constant stroke travel at all times. The control force required to vary delivery (move the cylinder block) is low in magnitude.

The hydraulic balance of the cylinder block, combined with the use of long, self-aligning connecting rods working in spherical seats, and the absence of centrifugal forces on the reciprocating parts, virtually eliminates undesirable forces. This provides for sensitive, fast response and stable control of the pump delivery.

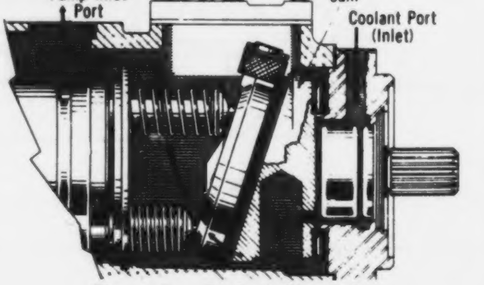


Sealed Portion of Stroke
Suction Portion of Stroke
Total Constant Stroke Travel of Piston

Figure 4 — Variable Delivery

4 COOLANT CIRCULATION (Figure 5)

The rotary motion of the cam is utilized to provide a centrifugal pumping action. This causes fluid to be drawn from the reservoir through the cooling port connection and through low restriction passages in the pump housing to the cam. The fluid pumped by the cam, during zero flow and near zero flow operation of the pump, is adequate to provide lubrication and prevent excessive heat build up. This permits extended zero flow operation at stabilized conditions. Fluid is returned to the reservoir through what is normally the inlet connection to the pump. **NOTE:** The cooling line must be connected to the reservoir below oil level.



Pump Inlet Port
Cam
Coolant Port (Inlet)

Figure 5 — Coolant Circulation

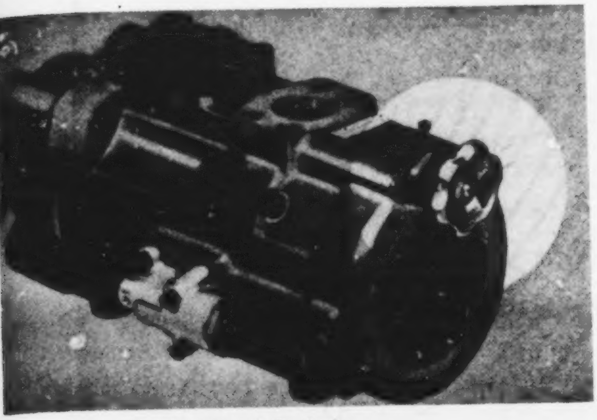


Figure 6 Handwheel Control

1 HANDWHEEL CONTROL

A. Loosen locking device (either nut or screw) and adjust handwheel for desired delivery.

B. To reduce pump delivery, rotate handwheel in clockwise direction.

C. To increase pump delivery, rotate handwheel in counter-clockwise direction.

D. Tighten locking device.

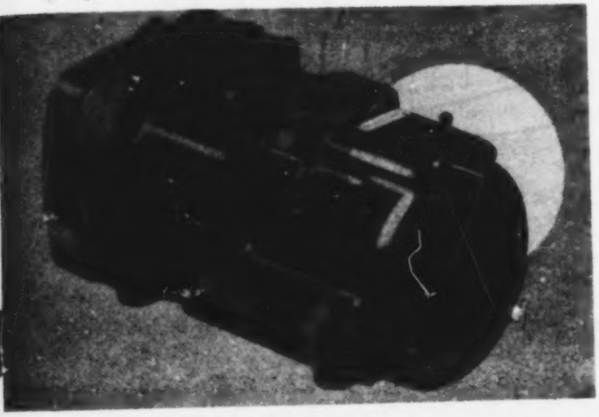


Figure 7 Stem Control

2 STEM CONTROL

A. No locking device is used on this control.

B. Axial pull at stem control clevis reduces pump delivery.

C. Axial push at stem control clevis increases pump delivery.

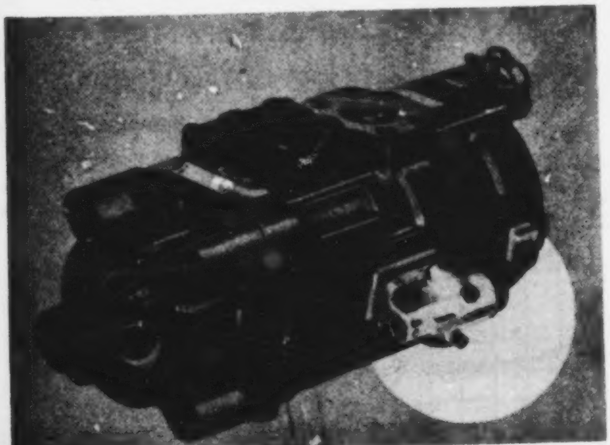


Figure 8 Pressure Compensator

3 PRESSURE COMPENSATOR

A. Reduce pump discharge pressure to lowest possible in order to minimize effort required to adjust setting.

B. Loosen locknut and set control for desired pressure.

1. Rotate adjustment screw in clockwise direction to increase pressure setting. One full turn of the adjustment screw will change the pressure setting approximately 960 P.S.I.
2. Rotate adjustment screw in counter-clockwise direction to reduce pressure setting.

C. Maximum pressure adjustment limit is preset in order to protect the pump against overload and must not be exceeded.

D. Tighten locknut.

NOTE: Other controls require special adjustment procedures. Please contact your local Weatherhead representative or the manager of the Application Engineering Department.

MODEL W21 SERIES

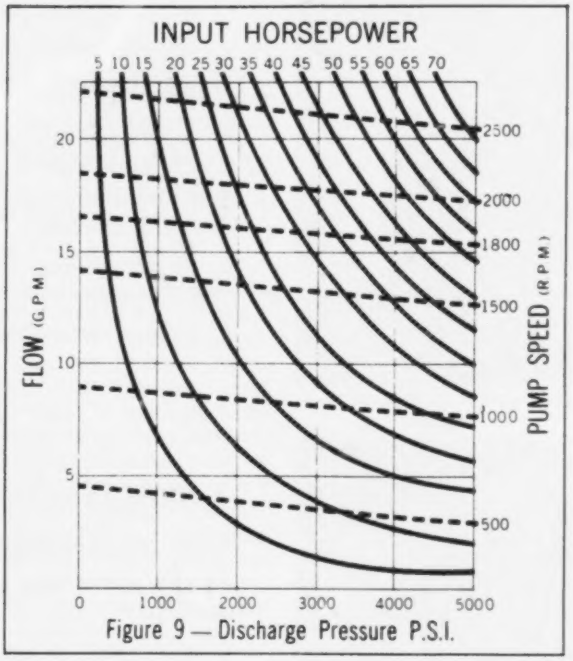


Figure 9 — Discharge Pressure P.S.I.

MODEL W32 SERIES

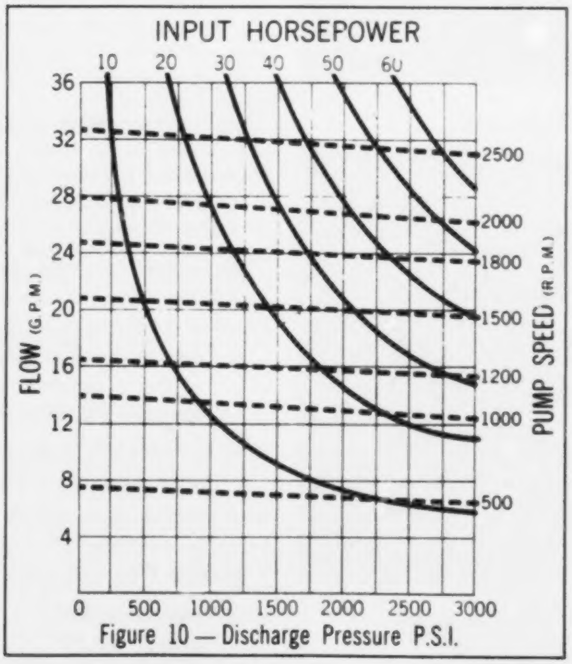


Figure 10 — Discharge Pressure P.S.I.

The typical full displacement performance curves shown above are based on use of Type 'A' automatic transmission fluid at an inlet temperature of + 130F. (viscosity: 109 ssu) and an inlet pressure of 0 psig.

section Ⓓ Preventive Maintenance

The following recommendations are offered as good operating practices for hydraulic systems in general and are not limited to systems in which Weatherhead Variable Displacement Hydraulic Pumps are used.

A All non-pressure compensated Weatherhead pumps should be protected from system pressure overload. An overload relief valve of suitable capacity should be installed as near as practical to the pump outlet. This valve should be adjusted to a pressure just above the maximum system pressure. However, in no case should the pressure exceed the maximum pressure rating of the pump as shown in Section H, Page 13 of this manual. The relief valve(s) in the system should be inspected and adjusted for proper function periodically.

B The system oil supply must be kept free of foreign materials and impurities. The reservoir should be equipped with an air filter at the breather cap or vent, a return oil strainer or filter, a filler pipe screen and appropriate cleanout provisions. A baffle should be used to minimize fluid aeration and insure proper circulation of the fluid in the reservoir.

C Whenever any component of the hydraulic system is opened or removed from the circuit, care should be exercised to avoid entry into the system of scale, paint, metal chips or filings, and water. Cap, plug, or cover any open joints in the system.

D All joints in the system should be checked for tightness periodically to prevent air leakage into the system or hydraulic fluid leakage from it.

E All mechanical components which transmit motion should be lubricated periodically in accordance with the manufacturer's recommendations. All linkage connections with other components should also be lubricated. This practice helps to reduce power requirements and increases the service life of all components.

F Check reservoir oil level frequently. An externally visible oil level indicator is often desirable. The reservoir oil volume should be a minimum of one and one-half to two times the volume the pump will deliver in one minute at maximum delivery and maximum drive speed used in the system.

G The system fluid should be checked frequently and changed whenever there is evidence of heavy sludge accumulations, frequent clogging of filter elements, viscosity below minimum specification for the fluid used, or the acidity number of the fluid exceeds supplier's recommendations. When the fluid is changed, the entire system should be drained and the reservoir thoroughly cleaned.

H The lip-type shaft seal used in the Weatherhead Variable Displacement Pump is of the highest quality. However, time in service and operating conditions affect its useful life. Therefore, it is impractical to specify a particular time interval for changing the seal. Regular inspection is recommended at the time the system is regularly lubricated. The seal should be changed if:

1. There is evidence of oil leakage at the shaft or from the cavity in which the seal is installed.

2. The lip of the seal appears charred, cracked, or brittle.

3. The lip of the seal is not in complete contact with the shaft.

4. There is evidence of fluid aeration not caused by loose connections in the low pressure branches of the system, excessive fluid turbulence in the reservoir, low fluid level in the reservoir, or pump inlet line not submerged.

section Ⓔ Trouble Shooting Chart

NOTE: **Review Preventive Maintenance Suggestions (Section D)**

SYMPTOMS	PROBABLE CAUSE	REMEDY
PRESSURE COMPENSATOR HUNTING OR CHATTERING AT FULL CUT-OFF	Control Piston Damaged in Pump	Inspect and Replace
	Compensator Valve Liner "O" Ring Damaged	Inspect and Replace
	Scored Pilot Valve or Damaged Pilot Valve Bore in Valve Liner	Inspect and Replace Damaged Part
	Damaged Check Valve in Pump	Inspect and Replace Outlet Cover Sub-assembly
	Damaged "O" Ring in Spacer Plate Beneath Compensator Valve	Inspect and Replace
OVERHEATING OF PUMP CASE WITH PUMP OPERATING AT FULL CUT-OFF	Complete or Partial Failure of Bearing Cooling Circuit	Check the Intake and Bearing Cooling Lines, Fittings, and Valves for Leaks and Repair, Inspect Intake Filter or Strainer for Plugging
	Bearings of Rotating Group Damaged	Inspect and Replace
	Control Piston Damaged in Pump	Inspect and Replace
	Compensator Valve Liner "O" Ring Damaged	Inspect and Replace
	Scored Metering Land on Pilot Valve or Damaged Pilot Valve Bore in Valve Liner	Inspect and Replace
	Damaged "O" Ring in Spacer Plate Beneath Compensator Valve	Inspect and Replace
	Damaged Check Valve in Pump	Inspect and Replace Outlet Cover Assembly
	Air Leak Through Shaft Seal of Pump	Replace Shaft Seal Cartridge or "O" Ring on Seal Cartridge
FAILURE TO MAINTAIN PROPER DISCHARGE PRESSURE	Compensator Improperly Adjusted	Adjust (Increase or Decrease) Pressure Setting (See Section C)
	Broken or Damaged Compensator Control Spring	Inspect and Replace
	Damaged Check Valve in Pump	Inspect and Replace Outlet Cover Sub-assembly
	Control Mechanism Damaged	Inspect and Replace Damaged Part
LEAKAGE AT SHAFT SEAL	Scored Pump Cam at Seal Diameter	Inspect and Replace Cam
	Defective "O" Ring on Seal Cartridge	Inspect and Replace
	Cut or Damaged Sealing Lips of Shaft Seal	Inspect and Replace Seal Cartridge
EXTERNAL LEAKAGE	Damaged Cover "O" Ring	Inspect and Replace
	Torn Gasket Between Cover and Housing	Inspect and Replace
	Channel Insert Seal Defective	Inspect and Replace Gaskets
	Plug "O" Ring Defective	Inspect and Replace
	Control Mechanism Seals Damaged	Inspect and Replace

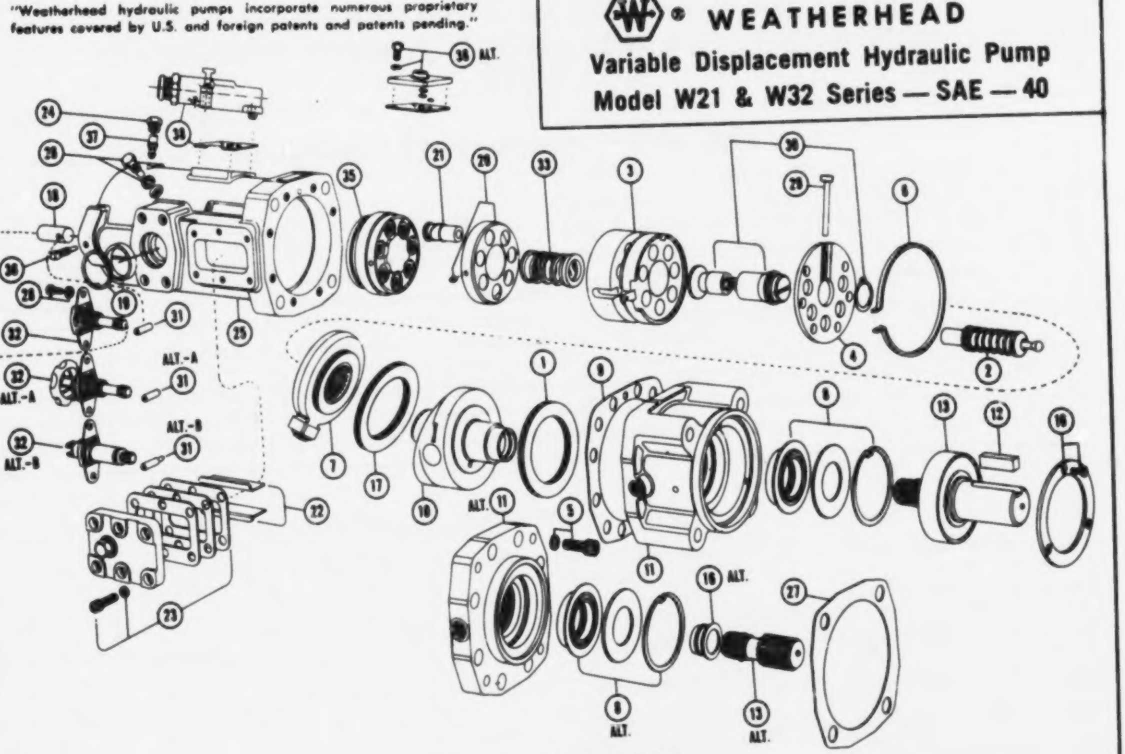
NOTE: **The Weatherhead Variable Displacement Hydraulic Pump is built to provide dependable performance under severe service conditions. It will seldom require extraordinary servicing procedures. However, if inspection of the pump reveals damages to the drive or pumping groups, it is suggested that the pump be returned to The Weatherhead Company for inspection, analysis, and repair. Any information pertinent to the operating conditions in the system or other contributing cause of failure which can be provided will aid considerably in analysis and remedy.**

W21 AND W32 COMMON PARTS

"Weatherhead hydraulic pumps incorporate numerous proprietary features covered by U.S. and foreign patents and patents pending."

WEATHERHEAD

Variable Displacement Hydraulic Pump
Model W21 & W32 Series — SAE — 40



†O.H.L. DESIGN

Reference Number	Number Required	Part Number	COMMON PARTS Description
1	1	408-03005	Bearing Assy.
*2	7	408-03006	Piston Assy.
*3	1	408-01020	Cylinder Block
4	1	408-01073	Support Plate
5	8	408-03007	Drive Cover Bolt & Washer
6	1	408-00634	Support Retainer
7	1	408-00688-03	Reaction Member Assy.
8	1	408-03008	Drive Shaft Seal Assy.
9	1	408-00821	Drive Cover Gasket
10	1	408-00860	Cam Assy.
11†	1	408-00878	Drive End Cover Assy.
12†	1	408-00877	Shaft Key
13†	1	408-03041	Drive Shaft Assy.
16†	1	408-03040	Bearing Retainer
17	1	408-03009	Bearing Assy
18	1	408-00842	Traverse Bearing
19	1	408-03010	Inlet Sleeve and Retainer
*20	1	408-03011	Reaction Spring Cup & Pins
*21	7	408-03012	Reaction Piston Assy.

Reference Number	Number Required	Part Number	COMMON PARTS Description
22	2	408-01059	Channel Plates
23	1	408-03013	Channel Cover Assy.
24	1	408-03025	Transfer Tube Plug Assy.
26	1	408-03014	Cylinder Block Bolt
27	1	408-00729	Flange Mounting Gasket
28	1	408-03029	Control Bolts and Washers

† O.H.L. Design Part Not Used in P.T.O. Design — See Chart Below:
*If for W21 use part numbers listed below. †O.H.L. — OVERHUNG LOAD
**P.T.O. — POWER TAKE OFF

FOR ADDITIONAL PARTS SEE PAGE 8

****P.T.O. DESIGN**

Ref. No.	Part No.	Description
11 Alt.	408-00863	Drive End Cover Assy.
12 Alt.	408-00653	Drive Shaft Key
13 Alt.	408-03042	Splined Drive Shaft
13 Alt. "A"	408-03043	Keyway Drive Shaft
16 Alt.	408-00861	Shaft Retainer

***W21 COMMON PARTS**

Reference Number	Number Required	Part Number	Description
2	7	408-03053	Piston Assy.
3	1	408-00997	Cylinder Block
20	1	408-03054	Reaction Spring Cup & Pins
21	7	408-03055	Reaction Piston Assy.

THE WEATHERHEAD COMPANY
300 East 131st Street • Cleveland, Ohio 44108

Model W21 & W32 MAINTENANCE PARTS LIST

Date: 5-15-66
Dwg. No. 408-719
Rev. No.

Figure 11 — Exploded View and Parts List

Continued on Page 8

W21 AND W32 COMMON PARTS CONTINUED

			BASIC	ALTERNATES			
TYPE OF CONTROL			PRESSURE COMPENSATED	COMPENSATED W/HANDWHEEL	HANDWHEEL ONLY	STEM ONLY	SERVO ONLY (Pressure Sensing)
**-40 DESIGN P/N			408-01100-02	408-01085-01	408-01160-02	408-00915	408-01090-02
**-40 DESIGN P/N O.H.L.			408 01130-01	408-01095-01	408-01185-01	408-01080-01	408-01155-01
CODED MODEL NUMBER			W3230A-03B4*-**	W3230A-03M4*-**	W3230A-03C0*-**	W3230A-03S0*-**	W3230A-03E0*-**
REF.	QUAN.	DESCRIPTION					
25	1	Housing	408-00845-06	408-00845-06	408-00845-05	408-00845-05	408-00845-06
29	1	Control Tube Assy.	408-01061	408-01061	—	—	408-01061
30	1	Control Cylinder Assy.	408-03044	408-03044	—	—	408-03044
31	1	Cylinder Block Pin Assy.	408-00843	408-00843	408-00872	408-00872	408-00843
32	1	Manual Control Assy.	408-03019	408-03017	408-03017	408-03018	408-03019
33	1	Cylinder Block Spring Assy.	408-03045	408-03045	—	—	408-03045
35	1	Outlet Cover Assy.	408-01030-02	408-01030-02	408-01030-01	408-01030-01	408-01030-02
36	1	Control Set Screw	408-00651	408-00651	408-00651	408-00342-00001	408-00651
37	1	Transfer Tube Assy.	408-03047	408-03047	408-03046	408-03046	408-03047
38	1	Compensator Control Assy.	408-03048	408-03048	—	—	408-03052
	1	Complete Seal Kit — Std.	408-03049	SAME FOR ALL MODELS			
	1	Complete Seal Kit — EPR	408-03050				
	1	Complete Seal Kit — Viton	408-03051				

Standard Drive Shafts Are As Follows:

Design	Shaft	Description
P.T.O.	C	Straight Keyway — SAE
P.T.O.	N	Straight Spline — SAE
O.H.L.	D	1¾" Keyway

section Ⓕ Disassembly and Reassembly

DISASSEMBLY PROCEDURE W3230 SERIES AND W2150 SERIES WEATHERHEAD VARIABLE DISPLACEMENT AXIAL PISTON PUMP

GENERAL INSTRUCTIONS

All gaskets exposed during disassembly should be replaced.

Similarly, it is always best practice to replace all "O" rings. However, as a minimum precaution, all "O" rings should be carefully examined. Any which show evidence of extrusion, scuffing, tears, permanent set, swelling, shrinkage, charring or embrittlement should be replaced.

Any radial or thrust bearing assembly or bearing raceway showing any evidence of pitting, spalling, brinelling or oxidation should be replaced. Any radial needle bearing removed from its subassembly should not be reused.

If the pump is not to be reassembled immediately, all parts should be thoroughly cleaned, oiled, and covered for protection.

NOTE: "***Items**" . . . Instruction applies only if pump is so equipped.

PROCEDURE.

***1.** Remove control assembly (38) from control pad of housing (25).

2. Remove channel cover assembly (23).

3. Remove both channel inserts (22). Be sure to mark the side of the anti-rotation slot from which each was removed so that they will be re-installed in the same place.

4. Install a 1$\frac{5}{16}$-12UN threaded hexagon plug or fitting in the outlet port. Raise the pump into vertical position, drive shaft upward, and place the outlet fitting hexagon in a bench vise. Tighten vise securely.

5. Remove socket-head cap screws and lockwashers (5). Loosen all screws only two or three turns at a time to prevent excessive skewing of the cover and damage to threads.

6. Remove drive end group:

A Hold the drive shaft (13) with one hand and, with the other hand, reach under the cover (11) and support the cam (10). Lift, until the cam is clear of the housing flange.

B Remove thrust bearing group (17) from reaction member sub-assembly (7).

C Remove cam sub-assembly (10) from cove (11).

NOTE: For -21 design, or O.H.L. designation pump assemblies, only: In some cases, the fit of the cam and drive coupling will be too tight to permit hand removal of the cam. In such cases, two levers, such as screwdrivers, may be used as follows:

1. Select two items, ½" to ¾" high, to serve as fulcrums for the levers. These should be of a material and configuration which will not mar the gasket surface of the cover. Place them on the gasket flange of the cover (11), 180° apart and positioned to correspond with the neutral axis of the cam.

2. Place the tips of the levers under the thrust bearing surface of the cam (10) outside of the bearing assembly (11).

3. Apply uniform and equal force to both levers to free the cam. Do not strike the levers.

4. Remove the three flat-head machine screws (15) and retaining plate (16). In most cases, hand removal of the drive coupling (13) will be easily accomplished. Otherwise, an arbor press may be used by supporting the cover (11), drive shaft downward, and axially pressing the drive, inboard, end of the shaft. Do not strike the coupling as this may damage the ball bearing.

D Remove thrust bearing assembly (1).

E Remove reaction member assembly (7). Use care to prevent damage to the reaction member pin bearing. Identify corresponding sides of the pin bearing and anti-rotation slot by temporary end marking of the bearing so that it will be in the same position at reassembly.

F Remove the retaining ring, retaining plate, and shaft seal sub-assembly (8) from bearing cover sub-assembly (11).

7. Remove cover gasket (9).

8. Remove piston assemblies (2). At removal, arrange these parts so they can be placed in the same relative locations during reassembly.

***9.** Remove control tube (29).

10. Remove retaining ring (6) with a pair of needle-nose pliers.

11. Remove support plate (4) *and control cylinder assembly (30).

12. Loosen set screw (36) at least four full turns.

13. Remove retaining ring and bearing sleeve (19) from inlet port.

14. Remove hexagon-head cap screws and lockwashers (28).

15. Unthread manual control assembly (32) from traverse bearing (18) and remove. The traverse bearing may be reached through the inlet port and permit extraction of cylinder block pin (31). A 10-24NC screw may be threaded into the end of the pin to aid in extraction.

16. Remove the traverse bearing (18).

17. Remove cylinder block alignment bolt and seal washer (26).

18. Remove cylinder block (3).

19. Remove retainer and spring (33).

20. Remove plug and "O" ring (24).

21. Remove transfer tube (37). A 10-24NC screw should be threaded into the end of the tube to aid in extraction.

22. Remove housing and end cover group assembly from the bench vise and press end cover group (35) until free of close fit in housing and carefully guide out of housing.

23. Press center portion of reaction piston spring cup (20) only as much as required to permit extraction of three spring cup pins with a small bar magnet.

24. Remove reaction piston spring cup (20).

25. Remove reaction piston assemblies (21). Arrange these parts so they will be placed in the same locations during reassembly. It is not necessary to remove the reaction springs, spring retainers, or retaining rings separately.

26. Outlet Cover Assembly (35): Service of this sub-assembly should not normally be required, or attempted, in the field. Should malfunction or damage be suspected or evident, it is suggested that a replacement sub-assembly be used and the sub-assembly in question be returned to The Weatherhead Company for inspection and/or service.

ASSEMBLY PROCEDURE W3230 SERIES AND W2150 SERIES WEATHERHEAD VARIABLE DISPLACEMENT AXIAL PISTON PUMP

GENERAL INSTRUCTIONS

All parts should be cleaned and oiled prior to assembly.

All "O" rings must be properly lubricated during installation. The "O" rings, grooves, and all surfaces over which the "O" rings slide should be lubricated with hydraulic fluid, petroleum jelly, or a good grade of cup grease. **NOTE:** The lubricant used must be compatible with the "O" ring compound.

NOTE: "*" Items . . . Instruction applies only if pump is so equipped.

1. Place lapped end faces of reaction piston assemblies (21) on check valve seats of outlet cover assembly (35).

2. Guide reaction piston spring cup (20) over reaction pistons, compressing springs into position on outlet cover and install three spring cup pins, large end first.

3. Install outlet cover assembly (35) into pump housing (25) and rotate to align radial port with port in housing.

4. Install transfer tube assembly (37) in housing and into radial port of outlet cover. Press to bottom.

NOTE: Back-up rings are to be positioned in their respective grooves so that they are nearest each other. Use care to avoid tearing or cutting "O" rings or back-up rings during assembly.

5. Install plug (24) in port of housing. Tighten securely.

6. Install a $1\frac{5}{16}$-12 UN threaded hexagon-head plug or fitting in the outlet port.

7. Raise the assembly to a vertical position, open end of the housing upward, and place the outlet fitting hexagon into a bench vise and tighten vise securely.

8. Install spring and retainer (33).

section Ⓕ Reassembly

9. Align ⅜" wide longitudinal slot in cylinder block (3) with centerline of inlet port in the housing and guide cylinder block into position in housing. Care must be exercised to align reaction pistons (21) with cylinder bores.

10. Insert traverse bearing (18) into housing and, looking through the inlet port of the housing, align the hole in the traverse bearing with the longitudinal slot of the cylinder block and install cylinder block control pin (31) through the inlet port into the traverse bearing and bottom in the cylinder block slot.

11. Install manual control assembly (32) and thread into traverse bearing until end of traverse bearing, as seen through the inlet port, just clears the inlet port counterbore diameter.

12. Install inlet sleeve and retainer (19) in inlet port.

13. Install set screw (36) to lock manual control adjustment.

14. Install seal washer and cylinder block bolt (26).

***15.** Install control cylinder assembly (30) and support plate (4). Align radial slot with the center line of the control mounting pad on the housing. Install retaining ring (6). The extended prongs of the retaining ring should be aligned with the center line of the inlet port to permit the ring to properly seat in its groove. Slight, hold-down pressure should be exerted on the support plate during installation of the retaining ring.

***16.** Insert control tube (29) through hole in control pad on housing into hole in control cylinder (30). Control cylinder may be rotated into proper position to receive the tube by use of a screw driver in the slot at the end of the cylinder. The flange on the tube should be bottomed on the control pad.

17. Install piston assemblies (2). Be sure to place these in the cylinders from which they were removed.

18. Prepare drive end group as follows:

A Place shaft seal assembly (8) in cover (11).

B Place bearing assembly (1) on cover (11) guide diameter.

C Insert shaft seal tool, T498-03001, into drive end of cam (10). Lubricate tool to prevent damage to seal, and install cam in cover. Remove shaft seal tool.

D Place bearing assembly (17) and reaction member assembly (7) on cam (10).

***NOTE: For -21 design and O.H.L. designation pump assemblies, only, finish assembly as follows:**

A Support cam (10) so that it will not be axially displaced with respect to the cover subassembly (11) and install drive coupling subassembly (13). Press until ball bearing is flush with, or below, the retaining plate surface of cover.

B Position retaining plate (16) and secure in place using three flat-head machine screws (15).

19. Remove partial assembly from vise and lay pump housing on its side with the inlet port and anti-rotation slot at bottom most position.

20. Coat both sides of cover gasket (9) with a thin coat of petroleum jelly, hydraulic oil or lubricating grease and place in position on housing flange.

21. When handling drive end group as a unit for final assembly, make sure that reaction member pin bearing is in correct position at top dead center with respect to cam. Carefully place reaction member pin bearing into anti-rotation slot in housing and ease group into position. When in proper position, housing flange and cover will be separated by approximately ¾".

22. Place two, each, socket-head cap screws and lockwashers (5) 180° apart in assembly position and tighten only enough to hold the cover in place.

23. Raise the pump into a vertical position, drive shaft upward. Lift and place the outlet fitting hexagon into a bench vise. Tighten vise securely.

24. Install the remaining socket-head cap screws and lockwashers (5). Tighten all screws only two or three turns at a time to prevent excessive skewing of the cover and damage to threads. Final assembly torque should be 50-52 lb.-ft.

25. Remove pump from vise and lay on its side with the anti-rotation slot and inlet port uppermost.

26. Install, one on each side, channel inserts (22) so that the bent over portions of the inserts are supported on the housing flange. Be sure these are in the same relative position as when they were removed.

27. Place channel cover assembly (23) in position on anti-rotation slot flange. Install lockwashers and socket-head cap screws and tighten by criss-cross method to final torque of 15-17 lb.-ft.

***28.** Install control assembly (38). Tighten screws by criss-cross method. Final assembly torque should be 4.0 lb.-ft.

SUGGESTED TEST PROCEDURES

NOTE: Refer to Section C, Control Adjustments, and to Figure 12. Schematic of Suggested Test Circuit for **Weatherhead** Pump Flow Check. Use test orifices as indicated in table, Figure 13.

A Set selector valve (3) in neutral (open center) position. Start up pump.

B Set selector valve (3) so that pump discharge is directed to test orifice (1). Adjust the manual control mechanism (if the pump is so equipped) for maximum delivery (see section C). Maximum delivery is obtained when the test pressure gage reading is at its maximum point. Record the pressure gage reading, and from Figure 14, determine and record the equivalent flow for the test orifice used. Operate the pump for five minutes at this setting.

C Set the selector valve (3) so that the pump discharge is directed to test orifice (2). Record the pressure gage reading and, from Figure 14, determine and record the equivalent flow for the test orifice used. Operate the pump for five minutes at this setting.

D The difference between the indicated flow deliveries (reading from B minus reading from C) should be equal to or less than the value indicated on the Typical Performance Characteristics Graph, Figure 9, Section C, based on the difference in pressure reading (reading from C minus reading from B.)

E A visual check should be made to determine that there is no external leakage from the pump.

F Reduce the pressure setting of the pressure compensator control (if pump is so equipped) to the range of 500-1000psi (refer to Section C). Set the selector valve (3) so that the pump discharge is directed to test orifice (1). Close the hand-operated shut-off valve (7) and record pressure. Readjust the pressure setting of the pressure compensator control valve to the desired full cut-off pressure setting. Close shut-off valve and check setting. Open the shut-off valve and shut down the test system after proper setting is obtained.

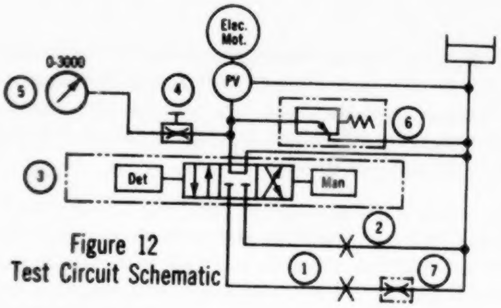


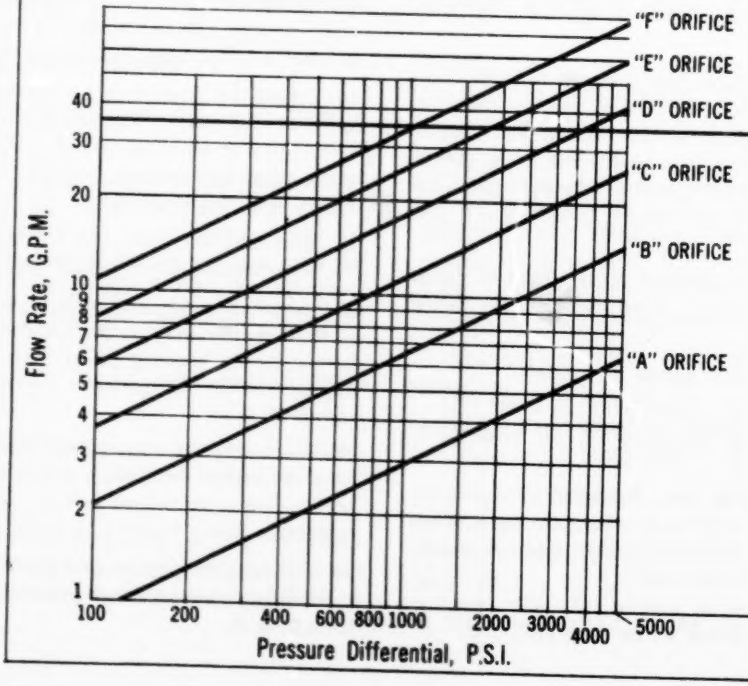
Figure 12
Test Circuit Schematic

1 Test Orifice-Fitting.
2 Test Orifice-Fitting.
3 Selector Valve (See Weatherhead Catalog 1234/65.)
4 Needle Valve (Gage Snubber.)
5 Pressure Gage, 0-3000 PSI, 20 PSI (Max.) Increments.
6 Relief Valve (3000 PSI) — Not Required if Pump Is Pressure Compensated.
7 Hand Operated Shutoff Valve.

Figure 13
Test Orifice
Guide

PUMP SERIES	ORIFICE #1 LETTER CODE	ORIFICE #2 LETTER CODE
W2150	1200 RPM D 1800 RPM E	B C
W3230	1200 RPM E 1800 RPM F	C D

Figure 14 — FLOW VERSUS PRESSURE DIFFERENTIAL
FOR WEATHERHEAD TEST ORIFICE SERIES



CHANGE No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *25 September 1972*

Operator's, Organizational, Direct Support, and General Support Maintenance Manual (With Illustrated Parts Breakdown) Including Repair Parts and Special Tools List

TEST STAND, HYDRAULIC SYSTEM, GASOLINE ENGINE DRIVEN
MODEL D-5B, FSN 4920-832-5491

TM 55-4920-341-14, 19 January 1972, is changed as follows:

Title is changed as shown above.

Page ii. The following is added after APPENDIX C:

APPENDIX D REPAIR PARTS AND SPECIAL TOOLS LIST D-1

Page D-1. Appendix D is added after page C-14 as follows:

APPENDIX D

REPAIR PARTS AND SPECIAL TOOLS LIST
(Current as of 10 May 1972)

Section I. INTRODUCTION

D-1. Scope.

This appendix lists parts required for the performance of direct support, general support and depot maintenance of the Test Stand, Hydraulic System Components, Type D-5B, P/N TE6759.

D-2. General.

This Repair Parts and Special Tools List is divided into the following sections:

a. Repair Parts List - Section II. A list of repair parts authorized for the performance of maintenance at the direct support, general support and depot level in figure and item number sequence.

b. Special Tools List - Section III. (Not applicable).

c. Federal Stock Number and Reference Number Index - Section IV. A list, in ascending numerical sequence of all Federal stock numbers appearing in the listings, followed by a list, in alphamerical sequence, of all reference numbers appearing in the listings. Federal stock numbers and reference numbers are cross-referenced to each illustration figure and item number appearance.

D-3. Explanation of Columns.

The following provides an explanation of columns in the tabular listing.

a. Source, Maintenance and Recoverability Codes (SMR), Column 1.

(1) *Source code.* Indicates the selection status and source for the listed item. Source codes are:

CODE	EXPLANATION
P	Repair parts, special tools and test equipment supplied from the GSA/DSA or Army supply system and authorized for use at indicated maintenance categories.
P2	Repair parts, special tools and test equipment which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system.
P9	Assigned to items which are NSA design controlled: unique repair parts, special tools, test, measuring, and diagnostic equipment which are stocked and supplied by the Army COMSEC Logistic System and which are not subject to the provisions of AR 380-41.
P10	Assigned to items which are NSA design controlled: special tools, test, measuring, and diagnostic equipment for COMSEC support which are accountable under the provisions of AR 380-41 and which are stocked and supplied by the Army COMSEC Logistic System.
M	Repair parts, special tools and test equipment which are not procured or stocked as such in the supply system but are to be manufactured at indicated maintenance levels.
A	Assemblies which are not procured or stocked as such but are made up of two or more units. Such component units carry individual stock numbers and descriptions, are procured and stocked separately, and can be assembled to form the required assembly at indicated maintenance categories.
X	Parts and assemblies that are not procured or stocked because the failure rate is normally below that of the applicable end item or component. The failure of such part or assembly should result in retirement of the end item from the supply system.
X1	Repair parts which are not procured or stocked. The requirement for such items will be filled by the next higher assembly or component.
X2	Repair parts, special tools and test equipment which are not stocked and have no foreseen mortality. The indicated maintenance category requiring such repair parts will attempt to obtain the parts through cannibalization or salvage. The item may be requisitioned, with exception data, from the end item manager for immediate use.

CODE	EXPLANATION
G	Major assemblies that are procured with PEMA funds for initial issue only as exchange assemblies at DS and GS level. These assemblies will not be stocked above DS and GS level or returned to depot supply level.

NOTE: Cannibalization or salvage may be used as a source of supply for any items source coded above except those coded X1 and aircraft support items as restricted by AR 700-42.

(2) *Maintenance Code*. Indicates the lowest category of maintenance authorized to install the listed item. Maintenance codes are:

CODE	EXPLANATION
C	Crew/operator maintenance.
O	Organizational maintenance.
F	Direct support maintenance.
H	General support maintenance.
D	Depot maintenance.

(3) *Recoverability code*. Indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are nonrecoverable. Recoverability codes are:

CODE	EXPLANATION
R	Repair parts (assemblies and components), special tools and test equipment which are considered economically reparable at direct and general support maintenance levels. When the item is no longer economically reparable, it is normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.
S	Repair parts, special tools and test equipment, and assemblies which are economically reparable at DS and GS activities and which normally are furnished by supply on an exchange basis. When items are determined by a GSU to be uneconomically reparable, they will be evacuated to a depot for evaluation and analysis before final disposition.
T	High dollar value recoverable repair parts, special tools and test equipment which are subject to special handling and are issued on an exchange basis. Such items will be repaired or overhauled at depot maintenance activities only. No repair may be accomplished at lower levels.
U	Repair parts, special tools and test equipment specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value, or reusable casings or castings.

b. Federal Stock Number, Column 2. Indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description, Column 3. Indicates the Federal item name and a minimum description required to identify the item. The description column contains the following subcolumns.

(1) *Reference number and manufacturer's code.* Indicates the reference number for the listed item followed by the applicable Federal supply code for manufacturers (FSCM), in parentheses. The FSCM is used as an element in item identification to designate manufacturer or distributor or Government agency, etc. and is identified in SB 708-42.

(2) *Usable on code.* (not applicable)

d. Unit of Measure (U/M), Column 4. Indicates the standard or basic quantity by which the listed item is used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation, e.g., EA, FT, PR.

e. Quantity Incorporated in Unit, Column 5. Indicates quantities required for one assembly only, including instances when similar assemblies are broken down together. A "V" appearing in this column in lieu of a quantity indicates that no specific quantity is applicable, e.g., shims, spacers.

f. Thirty-day DS/GS Maintenance Allowance, Column 6.

(1) The allowance column is divided into three subcolumns. Indicated in each subcolumn is the total quantity of items authorized for the number of equipments supported. Items identified with an asterisk in this column will be requisitioned initially on an "as required" basis for the maintenance mission at DS/GS levels. Requirements for repair parts stockage and for distribution to supported units will be based on demand and determined in accordance with AR 710-2.

(2) Determination of the total quantity of parts required for maintenance of more than 100 of these equipments can be accomplished by converting the equipment quantity to a decimal factor by placing a decimal point before the next to last digit of the number to indicate hundredths, and multiplying the decimal factor by the parts quantity authorized in the 51-100 allowance column. Example: authorized allowance for 51-100 equipments is 40; for 150 equipments, multiply 40 by 1.50, or 60 parts required.

g. One-year Allowance per 100 Equipments/Contingency Planning Purposes, Column 7. (Not applicable).

h. Depot Maintenance Allowance per 100 Equipments, Column 8. This column indicates the total quantity of items authorized to support the overhaul and repair of 100 components or equipments. Items identified with an asterisk in this column will be requisitioned initially on an "as required" basis for the maintenance mission at depot level.

i. Illustration, Column 9. Illustrations appear in the narrative portion of this manual. This column is divided as follows:

(1) *Figure number, column 9a.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number, column 9b.* Indicates the callout number to reference the item in the illustration.

D-4. How to Locate Repair Parts.

a. When Federal Stock Number or Reference Number is Unknown:

(1) *First.* Find the exploded view illustration of the assembly or subassembly to which the repair part belongs.

(2) *Second.* Identify the repair part on the illustration and note the illustration figure and item number of the repair part.

(3) *Third.* Using the Repair Parts Listing, find the figure and item number listed in the illustration column.

b. When Federal Stock Number or Reference Number is Known:

(1) *First.* Using the Index of Federal Stock Numbers and Reference Numbers, find the pertinent Federal stock number or reference number. This index is in ascending FSN sequence followed by a list of reference numbers in ascending alphamerical sequence, cross-referenced to the illustration figure number and item number.

(2) *Second.* Using the Repair Parts Listing, find the figure and item number listed in the illustration column referenced in the Index of Federal Stock Numbers and Reference Numbers.

D-5. Abbreviations. (Not applicable).

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR CODE			USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS/GS MAINT ALW (a) 1-20	(b) 21-50	(c) 51-100	(7) 1-YR ALW PER 100 EQUIP CNTGCY	(8) DEPOT MAINT ALW PER 100 EQUIP	(9) ILLUSTRATION (a) FIG NO	(b) ITEM NO
	4920-832-5491	TE6759	(31682)	TEST STAND, HYDRAULIC SYSTEM........ COMPONENTS-TYPE D-5B		EA							11	
				SECTION II REPAIR PARTS LIST TEST STAND ASSEMBLY										
		28392	(31682)	CHASSIS ASSEMBLY.................. (SEE FIG.13 & 14)			1						11	2
P2-F--	9905-202-3639	MS35387-2	(96906)	REFLECTOR, INDICATING, CLEARANCE-.... AMBER		EA	4	*	*	*		*	11	5
P2-F--	9905-205-2795	MS35387-1	(96906)	REFLECTOR, INDICATING, CLEARANCE-.... RED		EA	4	*	*	*		*	11	9
P2-F--	4730-541-1116	TA155S4-16D	(00624)	COUPLING HALF, SELF-SEALING-1 IN....		EA	1	*	*	*		*	11	22
P2-F--	4730-541-1115	TA155S4-12D	(00624)	COUPLING HALF, SELF-SEALING-3/4 IN..		EA	1	*	*	*		*	11	23
P2-F--	4730*540-0392	TB155S4-8D	(00624)	COUPLING HALF, SELF-SEALING-1/2 IN..		EA	1	*	*	*		*	11	24
P2-F--	4730-546-4736	155S7-16D	(00624)	CAP, DUST, SELF-SEALING COUPLING-.... 1 IN.		EA	1	*	*	*		*	11	25
P2-F--	4730-561-1544	155S7-12D	(00624)	CAP, DUST, SELF-SEALING COUPLING-.... 3/4 IN.		EA	1	*	*	*		*	11	26
P2-F--	5340-594-7136	155S7-8D	(00624)	CAP, DUST, SELF-SEALING COUPLING-.... 1/2 IN.		EA	1	*	*	*		*	11	27
P2-F--	5340-576-5545	155S9-8D	(00624)	PLUG, PROTECTIVE, DUST AND MOISTURE.. SEAL-1/2 IN.		EA	2	*	*	*		*	11	29
P2-F--	4730-098-4273	E155-25-8D	(00624)	NUT, UNION-1/2 IN.................		EA	2	*	*	*		*	11	30
P2-F--	4730-540-0393	T150S1-8D	(00624)	COUPLING HALF, SELF-SEALING-1/2 IN..		EA	2	*	*	*		*	11	31
P2-F--	4720-241-4404	3600000-8V1200	(78570)	HOSE ASSEMBLY, NONMETALLIC..........		EA	1	*	*	*		*	11	32
P2-F--	4730-804-1926	MS24392-8	(96906)	NIPPLE, TUBE-1/2 IN................		EA	1	*	*	*		*	11	33
P2-F--	5340-561-1545	155S9-12D	(00624)	PLUG, PROTECTIVE, DUST AND MOISTURE.. SEAL-3/4 IN.		EA	2	*	*	*		*	11	34
P2--F--	4730-098-4274	E155-25-12D	(00624)	NUT, UNION-3/4 IN..................		EA	2	*	*	*		*	11	35
P2--F--	4730-541-1113	T150S1-12D	(00624)	COUPLING HALF, SELF-SEALING-3/4 IN..		EA	2	*	*	*		*	11	36
P2-F--	4720-253-0891	3600000-12V1200	(78570)	HOSE ASSEMBLY, NONMETALLIC..........		EA	1	*	*	*		*	11	37
P2-F--	5340-631-0888	155S9-16D	(00624)	PLUG, PROTECTIVE, DUST AND MOISTURE.. SEAL-1 IN.		EA	2	*	*	*		*	11	38
P2-F--	4730-098-4275	E155-25-16D	(00624)	NUT, UNION-1 IN....................		EA	2	*	*	*		*	11	39
P2-F--	4730-555-0978	T150S1-16D	(00624)	COUPLING HALF, SELF-SEALING-1 IN....		EA	2	*	*	*		*	11	40
P2-F--	4720-253-0764	130S5-368-1200	(78570)	HOSE ASSEMBLY, NONMETALLIC..........		EA	2	*	*	*		*	11	41
P2-F--	4720-684-6913	MS24392D16	(96906)	NIPPLE, TUBE-1 IN..................		EA	1	*	*	*		*	11	42
P2-F--	2530-756-1210	MS24322-5A6	(96906)	WHEEL, PNEUMATIC TIRE..............		EA	4	*	*	*		*	11	
P2-F--	2610-089-5997	6-00-9	(73808)	INNER TUBE, PNEUMATIC TIRE..........		EA	4	*	*	*		*	11	

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR CODE			USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS/GS MAINT ALW			(7) 1-YR ALW PER 100 EQUIP CNTGCY	(8) DEPOT MAINT ALW PER 100 EQUIP	(9) ILLUSTRATION	
								(a) 1-20	(b) 21-50	(c) 51-100			(a) FIG NO	(b) ITEM NO
				CHASSIS ASSEMBLY										
P2-H--	2805-231-8080	MVG4D280658	(66289)	ENGINE,GASOLINE.................. (SEE FIG.51 THRU 63)		EA	1	*	*	*		*	13	1
P2-H--	4320-244-9924	408-01180-01	(79470)	PUMP,HYDRAULIC................... (SEE PAGES C-9 & C-10 FOR ILLUSTRATION)		EA	1	*	*	*		*	13	2
P2-F--	3120-992-8416	408-03005	(79470)	.BEARING ASSEMBLY................		EA	1	*	*	*		*	13	2
P2-F--	3930-404-3456	408-00688-03	(79470)	.REACTION MEMBER.................		EA	1	*	*	*		*	13	2
P2-F--	4320-992-8294	408-03008	(79470)	.SEAL,DRIVE SHAFT ASSEMBLY........		EA	1	*	*	*		*	13	2
P2-F--	3120-992-8299	408-03009	(79470)	.BEARING ASSEMBLY................		EA	1	*	*	*		*	13	2
P2-F--	3930-404-3461	408-01059	(79470)	.PLATE,CHANNEL....................		EA	2	*	*	*		*	13	2
P2-F--	6115-144-0230	GJP7403A	(19728)	GENERATOR,DIRECT CURRENT..........		EA	1	*	*	*		*	13	3
P2-F--	2920-177-2377	591230	(31947)	REGULATOR,VOLTAGE................		EA	1	*	*	*		*	13	4
P2-F--	5945-457-5303	5-58	(08018)	SOLENOID,ELECTRICAL..............		EA	1	*	*	*		*	13	5
P2-F--	6140-979-5681	LX1	(85357)	BATTERY,LEAD ACID................		EA	1	*	*	*		*	13	6
P2-F--	3040-251-2245	500	(13228)	COUPLING,SHAFT,RIGID..............		EA	1	*	*	*		*	13	7
P2-F--	5310-167-0823	AN960-816	(88044)	WASHER,FLAT......................		EA	4	*	*	*		*	13	12
P--F--	5310-800-0695	MS35335-39	(96906)	WASHER,LOCK......................		EA	4	*	*	*		*	13	15
P2-F--	5310-167-0825	AN960-1016	(88044)	WASHER,FLAT......................		EA	4	*	*	*		*	13	17
P2-F--	5310-167-0721	MS35333-41	(96906)	WASHER,LOCK......................		EA	11	*	*	*		*	13	21
P2-F--	2990-993-0447	WD50A	(66289)	MUFFLER,EXHAUST..................		EA	1	*	*	*		*	13	26
P--F--	5310-595-7237	MS35333-42	(96906)	WASHER,LOCK......................		EA	2	*	*	*		*	13	29
P2-F--	3030-528-4753	4L430	(72781)	BELT,V...........................		EA	1	*	*	*		*	13	30
P--F--	2990-245-0008	28624-1	(31682)	EXHAUST PIPE.....................		EA	1	*	*	*		*	13	39
P2-F--	5330-247-4063	28536-6	(31682)	GASKET...........................		EA	1	*	*	*		*	13	43
P2-F--	4920-235-4541	28571	(31682)	FLOW CONTROL,HYDRAULIC............		EA	1	*	*	*		*	13	44
		28537	(31682)	GENERATOR SHIELD ASSEMBLY..........			1						13	46
P2-F--	5910-538-3232	48P18	(56289)	.CAPACITOR,FIXED..................		EA	2	*	*	*		*	13	46
P2-F--	5910-668-8181	48P12	(56289)	.CAPACITOR,FIXED..................		EA	1	*	*	*		*	13	46
P2-F--	5930-259-9496	17121-0	(73168)	SWITCH,THERMOSTATIC...............		EA	1	*	*	*		*	13	48
P2-F--	5330-624-9938	QD727	(66289)	GASKET-MUFFLER ADAPTER FLANGE......		EA	1	*	*	*		*	13	49
P2-F--	5340-533-3511	EAB700-4	(81996)	CLAMP,LOOP........................		EA	2	*	*	*		*	13	50
				CHASSIS ASSEMBLY										
P2-F--	4920-829-7781	63080	(81321)	FILTER,FLUID PRESSURE..............		EA	1	*	*	*		*	14	54
P2-F--	4330-804-1541	AN6236-3	(88044)	.FILTER ELEMENT,FLUID PRESSURE.....		EA	1	*	*	*		*	14	54
		28343	(31682)	FLUID TANK ASSEMBLY...............			1						14	56
P2-F--	4920-241-5277	28347-1	(31682)	.FILLER CAP ASSEMBLY..............		EA	1	*	*	*		*	14	56
		AC8047-1210S	(01414)	FILTER,FLUID PRESSURE..............			1						14	57
P--F--	4330-277-3274	AN6235-4A	(88044)	.FILTER ELEMENT,FLUID PRESSURE.....		EA	1	*	*	*		*	14	57
P2-F--	5310-167-0818	AN960-10	(88044)	WASHER,FLAT.......................		EA	10	*	*	*		*	14	69
X2-F--		YE435E	(66289)	CHOKE CONTROL.....................		EA	1						14	70
P2-F--	5930-274-5124	YC10C	(66289)	SWITCH,PUSH-STARTER...............		EA	1	*	*	*		*	14	71
P2-F--	5930-655-1582	MS35059-23	(96906)	SWITCH,TOGGLE-IGNITION............		EA	1	*	*	*		*	14	72

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR CODE		USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS/GS MAINT ALW (a) 1-20	(b) 21-50	(c) 51-100	(7) 1-YR ALWPER 100 EQUIP CNTGCY	(8) DEPOT MAINT ALWPER 100 EQUIP	(9) ILLUSTRATION (a) FIG NO	(b) ITEM NO
P2-F--	5920-892-9311	FHN26G1 (81349)	FUSEHOLDER		EA	1	*	*	*		*	14	73
P2-F--	5920-134-5721	1201PS (30839)	SWITCH, PRESSURE		EA	1	*	*	*		*	14	80
P2-F--	5340-533-3511	EAB700-4 (81996)	CLAMP, LOOP		EA	2	*	*	*		*	14	81
P2-F--	5340-533-3511	EAB700-4 (81996)	CLAMP, LOOP		EA	2	*	*	*		*	14	82
X2-F--		LF131 (66289)	FLANGE, PIPE-MUFFLER		EA	2						14	89
P2-F--	5920-284-6787	F02A250V5A (81349)	FUSE, CARTRIDGE		EA	1	*	*	*		*	14	96
			HYDRAULIC LINES & FITTINGS										
P2-F--	4720-253-0892	130000-16Z0102 (78570)	HOSE ASSEMBLY, NONMETALLIC		EA	1	*	*	*		*	16	35
P2-F--	4820-134-4336	3C13-4-15 (46259)	VALVE, CHECK		EA	1	*	*	*		*	16	36
X2-F--		6S50XS (45681)	TEE		EA	1						16	40
X2-F--		4R6XS (45681)	TEE, SWIVEL		EA	2						16	43
X2-F--		4JTXS (45681)	TEE		EA	1						16	44
X2-F--		4RTXS (45681)	TEE		EA	1						16	45
P2-F--	4730-231-3019	MS20822-16 (96906)	ELBOW, PIPE TO TUBE		EA	1	*	*	*		*	16	46
P2-F--	4730-820-0726	16C6XS (45681)	ELBOW, TUBE		EA	1	*	*	*		*	16	47
P2-F--	4730-231-3019	MS20822-16 (96906)	ELBOW, PIPE TO TUBE		EA	3	*	*	*		*	16	54
X2-F--		6-4TRTXS (45681)	REDUCER, TUBE END		EA	2						16	57
X2-F--		8-4TRTXS (45681)	REDUCER, TUBE END		EA	1						16	58
X2-F--		8-8FTXS (45681)	CONNECTOR		EA	2						16	63
P2-F--	4730-925-8039	8-12F50XS (45681)	CONNECTOR		EA	2	*	*	*		*	16	71
X2-F--		4-4GTXS (45681)	CONNECTOR		EA	1						16	75
			FUEL TANK ASSEMBLY										
P2-F--	2910-247-6632	4350 (10203)	FILLER ASSEMBLY, FUEL TANK		EA	1	*	*	*		*	26	6
P2-F--	6680-435-4228	385B (57733)	SENDER, FUEL GAGE		EA	1	*	*	*		*	26	7
P2-F--	5330-250-9582	28442 (31682)	GASKET		EA	1	*	*	*		*	26	11
			CONTROL PANEL ASSEMBLY										
P2-F--	6620-241-5242	27787 (61349)	GAGE, PRESSURE		EA	1	*	*	*		*	28	1
P2-F--	6620-133-7703	30573 (61349)	GAGE, PRESSURE		EA	1	*	*	*		*	28	2
P2-F--	6680-600-6161	1536523 (70040)	TACHOMETER, MECHANICAL		EA	1	*	*	*		*	28	3
P2-F--	6625-420-8623	YE2 (66289)	AMMETER		EA	1	*	*	*		*	28	4
P2-F--	6620-698-6700	RS11 (66289)	GAGE, PRESSURE		EA	1	*	*	*		*	28	5
P2-F--	6680-726-1683	378P (57733)	GAGE, LIQUID QUANTITY-FUEL LEVEL		EA	1	*	*	*		*	28	6

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR CODE			USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS/GS MAINT ALW (a) 1-20	(b) 21-50	(c) 51-100	(7) 1-YR ALWPER 100 EQUIP CNTGCY	(8) DEPOT MAINT ALWPER 100 EQUIP	(9) ILLUSTRATION (a) FIG NO	(b) ITEM NO
P2-F--	6680-726-1683	378P	(57733)	GAGE,LIQUID QUANTITY-RESERVOIR LEVEL		EA	1	*	*	*		*	28	7
X2-F--		TT61F3	(66289)	THROTTLE CONTROL		EA	1						28	8
P2-F--	4820-134-4331	6144R3HC3K	(89326)	VALVE,SELECTOR		EA	1	*	*	*		*	28	10
X2-F--		105HD1-4	(13174)	COCK,PLUG		EA	1						28	11
P--F--	4730-278-5006	AN929-4	(88044)	CAP,TUBE		EA	2	*	*	*		*	28	12
P2-F--	5310-208-5769	AN924-4	(88044)	NUT,PLAIN,HEXAGON		EA	1	*	*	*		*	28	13
P--F--	6685-133-7711	30572	(61349)	GAGE,TEMPERATURE		EA	1	*	*	*		*	28	14
X2-F--		YM911-9	(72619)	FILTER LIGHT-H.P		EA	1						28	15
X2-F--		YM911-9	(72619)	FILTER LIGHT-L.P		EA	1						28	16
X2-F--		F125	(13902)	VALVE,SHUTOFF		EA	1						28	18
P2-F--	4820-241-4407	MV861S	(09990)	VALVE,BY-PASS		EA	1	*	*	*		*	28	19
P2-F--	4820-254-5849	1-1758-14R	(86768)	VALVE,FLOW CONTROL		EA	1	*	*	*		*	28	20
P2-F--	4820-254-5849	1-1758-14R	(86768)	VALVE,FLOW CONTROL		EA	1	*	*	*		*	28	21
P2-F--	4820-235-3959	1A32R12A6057	(96259)	VALVE,RELIEF		EA	1	*	*	*		*	28	22
X2-F--		MV461S	(09990)	COCK,PLUG		EA	1						28	23
P2-F--	6620-494-9645	RP927-11	(66289)	GAGE,OIL PRESSURE,ENGINE		EA	1	*	*	*		*	28	30
P2-F--	4730-715-0018	MS24393D4	(96906)	NIPPLE,TUBE		EA	1	*	*	*		*	28	33
P2-F--	6680-247-6671	28572	(31682)	INDICATOR,FLOW		EA	1	*	*	*		*	28	37
P2-F--	5310-550-1130	MS35333-40	(96906)	WASHER,LOCK		EA	22	*	*	*		*	28	42
P2-F--	5315-816-1794	MS24665-285	(96906)	PIN,COTTER		EA	1	*	*	*		*	28	45
P--F--	5310-595-7237	MS35333-42	(96906)	WASHER,LOCK		EA	4	*	*	*		*	28	49
P2-F--	4730-715-0018	MS24393D4	(96906)	NIPPLE,TUBE		EA	1	*	*	*		*	28	56
P2-F--	5310-208-5769	AN924-4	(88044)	NUT,PLAIN,HEXAGON		EA	1	*	*	*		*	28	57
P2-F--	6680-253-5721	6454458	(70040)	SHAFT ASSEMBLY,FLEXIBLE-TACHOMETER		EA	1	*	*	*		*	28	58
P--F--	6240-792-4196	1815	(24455)	LAMP		EA	2	*	*	*		*	28	93
				ENGINE ASSEMBLY										
P2-H--	2805-231-8080	MVG4D280658	(66289)	ENGINE,GASOLINE		EA	1	*	*	*		*	50	
P2-F--	5930-775-7577	YC66DS1	(66289)	.SWITCH,THERMOSTATIC-HIGH TEMP SAFETY		EA	1	*	*	*		*	50	
				MANIFOLD AND CRANKCASE										
X2-F--		AB97R2S1	(66289)	CYLINDER HEAD,GASOLINE ENGINE		EA	2						51	102
P2-F--	2910-255-2298	10-3774	(96152)	CARBURETOR,FLOAT (SEE PAGE B-78 FOR ILLUSTRATION)		EA	1	*	*	*		*	51	164
X2-F--		13-956	(96152)	.SHAFT,THROTTLE CONTROL		EA	1						51	
P2-F--	2910-328-9833	15-42	(96152)	.SCREW,THROTTLE ADJUSTING		EA	1	*	*	*		*	51	
P2-F--	5310-291-7918	16-4	(96152)	.WASHER,NONMETALLIC		EA	2	*	*	*		*	51	
P2-F--	5310-496-5413	16-456	(96152)	.WASHER,NONMETALLIC		EA	1	*	*	*		*	51	
P2-F--	5330-522-5358	16A105	(96152)	.GASKET-BOWL		EA	1	*	*	*		*	51	
P2-F--	2910-364-4996	233-536	(96152)	.VALVE AND SEAT,CARBURETOR-W/GASKET		EA	1	*	*	*		*	51	

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR CODE		USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS/GS MAINT ALW			(7) 1-YR ALWPER 100 EQUIP CNTGCY	(8) DEPOT MAINT ALWPER 100 EQUIP	(9) ILLUSTRATION	
							(a) 1-20	(b) 21-50	(c) 51-100			(a) FIG NO	(b) ITEM NO
X2-F--		24-485 (96152)	.SPRING,HELICAL,COMRRESSION		EA	1						51	
P2-F--	2910-429-2155	30-666 (96152)	.FLOAT AND LEVER		EA	1	*	*	*		*	51	
P2-F--	5330-726-0220	44-38 (96152)	.FELT,MECHANICAL,PREFORMED		EA	1	*	*	*		*	51	
X2-F--		47-395 (96152)	.NOZZLE,MAIN		EA	1						51	
X2-F--		65-172 (96152)	.FLOAT BOWL		EA	1						51	
P2-F--	2910-513-1711	286-776 (96152)	PARTS KIT,CARBURETOR		EA	V	*	*	*		*	51	
P2-F--	2910-030-3580	16-649 (96152)	GASKET SET,CARUBRETOR		EA	V	*	*	*		*	51	
P2-H--	5330-292-3984	QB83 (66289)	RETAINER,PACKING		EA	6	*	*	*		*	51	219
P2-H--	5330-399-6982	QC62 (66289)	GASKET		EA	2	*	*	*		*	51	220
P2-F--	2805-399-6984	QD631 (66289)	GASKET		EA	2	*	*	*		*	51	226
P2-F--	2805-428-2159	QD632 (66289)	GASKET		EA	2	*	*	*		*	51	227
P2-H--	5330-428-2162	QD635 (66289)	GASKET		EA	1	*	*	*		*	51	230
P2-F--	2805-624-9940	QF91 (66289)	GASKET		EA	1	*	*	*		*	51	237
P2-F--	5340-050-1591	MS35648-4 (96906)	PLUG,EXPANSION		EA	2	*	*	*		*	51	443
X2-F--		SA58 (66289)	PLUG,EXPANSION		EA	1						51	444
X2-F--		XK1 (66289)	PLUG,PIPE		EA	1						51	475
			CRANKSHAFT, PISTON AND CONNECTING ROD										
P2-H--	2805-605-1491	DA66A4S1 (66289)	ROD ASSEMBLY,CONNECTING		EA	4	*	*	*		*	52	119
P2-H--	2805-554-9255	MS13957-1 (96906)	PISTON,INTERNAL COMBUSION ENGINE-- STD SIZE		EA	4	*	*	*		*	52	120
P2-H--	2805-554-9822	MS13957-2 (96906)	PISTON,INTERNAL COMBUSTION ENGINE-. 0.020 IN.OVERSIZE		EA	V	*	*	*		*	52	120
P2-H--	2805-540-5299	MS13957-3 (96906)	PISTON,INTERNAL COMBUSTION ENGINE-. 0.040 IN.OVERSIZE		EA	V	*	*	*		*	52	120
P2-H--	2805-089-0560	DR25 (66289)	RING SET,PISTON-STD SIZE		EA	1	*	*	*		*	52	121
P2-H--	2805-733-3223	DR25S20 (66289)	RING SET,PISTON-0.020 IN.OVERSIZE		EA	V	*	*	*		*	52	121
P2-H--	2805-554-3951	MS13933-7 (96906)	RING,PISTON-COMPRESSION,NO.1 GROOVE,STD SIZE		EA	4	*	*	*		*	52	122
X2-H--		MS13933-8 (96906)	RING,PISTON-COMPRESSION,NO.1 GROOVE,0.020 IN.OVERSIZE		EA	V						52	122
X2-H--		MS13933-9 (96906)	RING,PISTON-COMPRESSION,NO.1 GROOVE,0.040 IN.OVERSIZE		EA	V						52	122
P2-H--	2805-640-8637	MS13932-7 (96906)	RING,PISTON-COMPRESSION,NO.2 GROOVE,STD SIZE		EA	4	*	*	*		*	52	123
X2-H--		MS13932-8 (96906)	RING,PISTON-COMPRESSION,NO.2 GROOVE,0.020 IN.OVERSIZE		EA	V						52	123
X2-H--		MS13932-9 (96906)	RING,PISTON-COMPRESSION,NO.2 GROOVE,0.040 IN.OVERSIZE		EA	V						52	123
P2-H--	2805-555-6093	MS13931-10 (96906)	RING,PISTON-OIL,NO.3 & 4 GROOVE STD SIZE		EA	V	*	*	*		*	52	124
X2-H--		MS13931-11 (96906)	RING,PISTON-OIL,NO.3 & 4 GROOVE, 0.020 IN.OVERSIZE		EA	V						52	124
X2-H--		MS13931-12 (96906)	RING,PISTON-OIL,NO.3 & 4 GROOVE, 0.040 IN.OVERSIZE		EA	V						52	124
X2-H--		MS13996-2 (96906)	PIN,PISTON		EA	4						52	125

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR CODE			USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS/GS MAINT ALW			(7) 1-YR ALW PER 100 EQUIP CNTGCY	(8) DEPOT MAINT ALW PER 100 EQUIP	(9) ILLUSTRATION	
								(a) 1-20	(b) 21-50	(c) 51-100			(a) FIG NO	(b) ITEM NO
P2-H--	3120-817-5081	MS13993-1	(96906)	BEARING HALF,SLEEVE-CONNECTING ROD.....		EA	8	*	*	*		*	52	135
P2-H--	3120-374-9710	MS13963-1	(96906)	BEARING,SLEEVE-PISTON PIN..........		EA	4	*	*	*		*	52	138
P2-H--	3110-100-4162	ME98	(66289)	BEARING,ROLLER,TAPERED.............		EA	2	*	*	*		*	52	183
P2-H--	5330-383-3549	PH202	(66289)	SEAL,PLAIN ENCASED................		EA	1	*	*	*		*	52	210
P2-H--	5365-374-9707	MS13962-1	(96906)	RING,RETAINING-PISTON PIN..........		EA	8	*	*	*		*	52	215
P2-H--	5330-584-1621	QD636A	(66289)	GASKET-BEARING PLATE...............		EA	2	*	*	*		*	52	231
P2-H--	5340-584-1612	QF67B	(66289)	SHIM-0.006 IN.THK..................		EA	2	*	*	*		*	52	235
P2-H--	5340-584-1613	QF67C	(66289)	SHIM-0.014 IN.THK..................		EA	3	*	*	*		*	52	236
P2-H--	2805-353-5912	RK173	(66289)	DEFLECTOR,DIRT AND LIQUID-......... CRANKSHAFT		EA	1	*	*	*		*	52	249
X2-F--		PL24	(66289)	KEY,WOODRUFF-FLYWHEEL..............		EA	1						52	438
P2-F--	5305-269-3213	MS90725-62	(96906)	SCREW,CAP,HEXAGON HEAD.............		EA	6	*	*	*		*	52	461
				CAMSHAFT AND FUEL PUMP MOUNTING										
P2-H--	2805-524-9552	EA112	(66289)	CAMSHAFT,ENGINE....................		EA	1	*	*	*		*	53	126
P2-F--	2910-905-9792	MS51086-1	(96906)	FILTER,FLUID,PRESSURE-FUEL.........		EA	1	*	*	*		*	53	178
P2-F--	2910-269-7126	OW363	(78480)	.BOWL,SEDIMENT.....................		EA	1	*	*	*		*	53	178
P2-F--	5330-187-2962	06096	(78480)	.WASHER,NONMETALLIC................		EA	1	*	*	*		*	53	178
P2-F--	2910-339-4836	LP38C	(66289)	PUMP,FUEL..........................		EA	1	*	*	*		*	53	179
P2-H--	2805-366-6248	PF101	(66289)	PLUNGER,CAMSHAFT THRUST............		EA	1	*	*	*		*	53	204
P2-H--	2805-366-6249	PM108	(66289)	SPRING,HELICAL,COMPRESSION.........		EA	1	*	*	*		*	53	217
P2-F--	5330-366-6351	QD67	(66289)	GASKET-PUMP ADAPTER MTG............		EA	1	*	*	*		*	53	221
P2-F--	5330-599-5966	QD538A	(66289)	GASKET-FUEL PUMP MTG...............		EA	1	*	*	*		*	53	223
X2-F--		RM1319L	(66289)	LINE,FUEL,FLEXIBLE.................		EA	1						53	256
P2-F--	2910-777-7183	TF96-4	(66289)	ADAPTER,FUEL PUMP..................		EA	1	*	*	*		*	53	348
P2-F--	5330-260-9311	AN6227-5	(88044)	.PACKING,PREFORMED.................		EA	1	*	*	*		*	53	349
P2-F--	2910-339-4837	LQ30A	(66289)	PARTS KIT,ENGINE FUEL PUMP.........		EA	V	*	*	*		*	53	
				IDLER GEAR AND OIL FILLER										
P2-H--	5330-536-1257	QD595A	(66289)	GASKET.............................		EA	1	*	*	*		*	54	224
P2-F--	2805-360-8326	RC91	(66289)	STRAINER ELEMENT,SEDIMENT..........		EA	1	*	*	*		*	54	239
P2-F--	2805-371-4615	RM536	(66289)	LINE ASSEMBLY,OIL..................		EA	1	*	*	*		*	54	252

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR CODE			USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS/GS MAINT ALW (a) 1-20	(b) 21-50	(c) 51-100	(7) 1-YR ALWPER 100 EQUIP CNTGCY	(8) DEPOT MAINT ALWPER 100 EQUIP	(9) ILLUSTRATION (a) FIG NO	(b) ITEM NO
				CYLINDER BLOCK ASSEMBLY										
X2-F--		AA90A2S1	(66289)	CYLINDER BLOCK ASSEMBLY............		EA	2						55	101
P2-H--	2805-574-8856	AD42A	(66289)	.GUIDE,VALVE STEM..................		EA	8	*	*	*		*	55	103
P2-H--	2805-382-8033	MS13999-8	(96906)	.VALVE,POPPET,ENGINE...............		EA	8	*	*	*		*	55	104
P2-H--	2805-505-5191	AP49A	(66289)	.SPRING,HELICAL,COMPRESSION........		EA	8	*	*	*		*	55	105
P2-H--	2805-339-5589	AG30	(66289)	.SEAT,VALVE SPRING.................		EA	8	*	*	*		*	55	106
P2-H--	2805-528-6097	MS13997-1	(96906)	.LOCK,VALVE SPRING RETAINER........		EA	16	*	*	*		*	55	107
P2-H--	2805-374-9746	MS13998-1	(96906)	.CAP,VALVE STEM....................		EA	8	*	*	*		*	55	108
P2-H--	2805-624-9949	F65	(66289)	.TAPPET,ENGINE POPPET VALVE........		EA	8	*	*	*		*	55	128
P2-H--	2805-424-2806	HG150D	(66289)	.SEAT,VALVE........................		EA	8	*	*	*		*	55	137
P2-H--	2805-536-8804	QD682	(66289)	.GASKET-VALVE COVER................		EA	4	*	*	*		*	55	222
				OIL PUMP ASSEMBLY										
P2-H--	4320-353-5884	K95L	(66289)	PUMP,ROTARY,POWER DRIVEN...........		EA	1	*	*	*		*	56	
P2-H--	2805-253-6919	PM111	(66289)	.SPRING,HELICAL,COMPRESSION........		EA	1	*	*	*		*	56	155
P2-H--	5330-765-2842	QD535A	(66289)	.GASKET-PUMP COVER.................		EA	1	*	*	*		*	56	156
P2-H--	2805-332-3722	RD112	(66289)	.STRAINER ELEMENT,SEDIMENT.........		EA	1	*	*	*		*	56	157
P2-H--	5315-839-5822	MS24665-353	(96906)	.PIN,COTTER........................		EA	1	*	*	*		*	56	162
				OIL FILTER, AIR SHROUDING AND AIR CLEANER										
P2-F--	2940-957-3768	LJ131-3	(66289)	TUBE,AIR CLEANER...................		EA	1	*	*	*		*	57	167
P2-F--	2940-202-9653	MS35343-1	(96906)	FILTER,FLUID,PRESSURE.............. (SEE PAGE B-49 FOR ILLUSTRATION)		EA	1	*	*	*		*	57	258
P--F--	2940-141-9025	C21P	(73370)	.FILTER ELEMENT,FLUID,PRESSURE.....		EA	1	*	*	*		*	57	258
P--F--	5310-262-3000	1522881	(73370)	.WASHER,FLAT-CAP SCREW.............		EA	1	*	*	*		*	57	258
P--F--	5330-599-1285	11582-2	(73370)	.WASHER,NONMETALLIC-COVER..........		EA	1	*	*	*		*	57	258
P2-F--	2805-397-9648	SE48-1	(66289)	SCREEN,FLYWHEEL-SHROUD.............		EA	1	*	*	*		*	57	265
				ELECTRIC STARTER MOUNTING										
P2-F--	2920-925-1417	MBG4116T	(19728)	STARTER,ENGINE,ELECTRICAL..........		EA	1	*	*	*		*	58	368
P2-F--	2920-547-4335	EBB44B	(19728)	.DRIVE,ELECTRIC STARTER............		EA	1	*	*	*		*	58	368

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR CODE			USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS/GS MAINT ALW (a) 1-20	(b) 21-50	(c) 51-100	(7) 1-YR ALW PER 100 EQUIP CNTGCY	(8) DEPOT MAINT ALW PER 100 EQUIP	(9) ILLUSTRATION (a) FIG NO	(b) ITEM NO
				MAGNETO AND GEAR COVER										
X2-F--		GD103-1	(66289)	GEAR,HELICAL-MAGNETO		EA	1						59	133
P--F--	5330-579-9545	33S44375-5885	(94135)	SEAL,PLAIN ENCASED		EA	1	*	*	*		*	59	211
P2-F--	5330-360-8381	QD616	(66289)	GASKET-MAGNETO MTG		EA	1	*	*	*		*	59	225
P2-H--	5330-536-8818	QD633	(66289)	GASKET-CRANKCASE SPACER		EA	1	*	*	*		*	59	228
P2-H--	2805-428-2161	QD634	(66289)	GASKET-GEAR COVER		EA	1	*	*	*		*	59	229
P2-F--	2920-966-3567	Y98CS1	(66289)	MAGNETO,IGNITION (SEE PAGE B-70 FOR ILLUSTRATION)		EA	1	*	*	*		*	59	366
P2-H--	3110-142-0908	7109X1	(43334)	.BEARING,BALL,ANNULAR		EA	1	*	*	*		*	59	
P2-H--	3110-844-7154	D5949A	(21387)	.BEARING,ROLLER,SELF-ALIGNING		EA	1	*	*	*		*	59	
P2-H--	5910-445-6891	MX2433	(82796)	.CAPACITOR,FIXED		EA	1	*	*	*		*	59	
P2-H--	2920-656-7411	RS2477C	(21387)	.COIL,IGNITION		EA	1	*	*	*		*	59	
P2-H--	2920-142-0888	A2437AX	(82796)	.CONTACT SET		EA	1	*	*	*		*	59	
P2-H--	2920-566-7395	BW2563C	(21387)	.COUPLING,IMPULSE,MAGNETO		EA	1	*	*	*		*	59	
P2-H--	5330-599-2216	H2473	21387	.PACKING,PREFORMED		EA	1	*	*	*		*	59	
P2-H--	2920-640-7234	X2765	(82796)	.ROTOR,IGNITION		EA	1	*	*	*		*	59	
P2-H--	2920-986-1995	TS2480	(82796)	.ROTOR,IGNITION		EA	1	*	*	*		*	59	
P2-H--	2920-356-1221	G3861	(21387)	.SEAL,PLAIN ENCASED		EA	1	*	*	*		*	59	
P2-H--	2920-997-1454	SK90	(82796)	PARTS KIT,IGNITION MAGNETO		EA	V	*	*	*		*	59	
				GOVERNOR ASSEMBLY										
P2-H--	2990-624-9956	TB4W1	(66289)	GOVERNOR,GASOLINE ENGINE		EA	1	*	*	*		*	60	279
P2-H--	5360-201-2031	PM76	(66289)	.SPRING,HELICAL,EXTENSION		EA	1	*	*	*		*	60	283
X2-H--		TA112AS1	(66289)	.SHAFT ASSEMBLY,GOVERNOR		EA	1						60	288
P2-H--	3110-117-0575	ME111	(66289)	..BEARING,BALL,ANNULAR		EA	1	*	*	*		*	60	290
P2-H--	3110-278-7283	ME112	(66289)	..BEARING,BALL,ANNULAR		EA	1	*	*	*		*	60	291
P2-H--	5315-010-6749	PL21	(66289)	..KEY,WOODRUFF		EA	1	*	*	*		*	60	293
P2-H--	2990-677-1771	TC322DS1	(66289)	..FLYWEIGHT,GOVERNOR		EA	2	*	*	*		*	60	295
P2-H--	5330-579-3158	MS28775-008	(96906)	.PACKING,PREFORMED		EA	1	*	*	*		*	60	302
P2-H--	2990-358-4789	QD615A	(66289)	.GASKET-HOUSING		EA	1	*	*	*		*	60	305
P2-H--	5340-050-1591	MS35648-4	(96906)	.PLUG,EXPANSION		EA	1	*	*	*		*	60	306
				RADIO SHIELDED MAGNETO IGNITION										
P2-F--	2920-810-7082	MS51009-1	(96906)	SPARK PLUG		EA	4	*	*	*		*	62	371
P2-F--	2920-941-6108	MS51011-13	(96906)	LEAD AND CONDUIT-NO.1		EA	1	*	*	*		*	62	373
P2-F--	2920-924-2042	MS51011-14	(96906)	LEAD AND CONDUIT-NO.2		EA	1	*	*	*		*	62	374
P2-F--	2920-887-1289	MS51011-10	(96906)	LEAD AND CONDUIT-NO.3		EA	1	*	*	*		*	62	375
P2-F--	2920-941-6108	MS51011-13	(96906)	LEAD AND CONDUIT-NO.4		EA	1	*	*	*		*	62	376

(1) SMR CODE	(2) FEDERAL STOCK NUMBER	(3) DESCRIPTION REFERENCE NUMBER & MFR CODE		USABLE ON CODE	(4) UNIT OF MEAS	(5) QTY INC IN UNIT	(6) 30-DAY DS/GS MAINT ALW (a) 1-20	(b) 21-50	(c) 51-100	(7) 1-YR ALW PER 100 EQUIP CNTGCY	(8) DEPOT MAINT ALW PER 100 EQUIP	(9) ILLUSTRATION (a) FIG NO	(b) ITEM NO
P2-F--	5930-224-5668	YC9PS1 (66289)	SWITCH-PUSH-PULL-GROUNDING..........		EA	1	*	*	*		*	62	392
			GASKET SET										
P2-F--	5330-654-4275	Q18B (66289)	GASKET SET,GASOLINE ENGINE..........		EA	V	*	*	*		*	63	
P2-H--	2805-986-1793	Q27 (66289)	GASKET SET,VALVE GRINDING...........		EA	V	*	*	*		*	63	

SECTION III
SPECIAL TOOLS LIST
(NOT APPLICABLE)

SECTION IV
FEDERAL STOCK NUMBER AND REFERENCE NUMBER INDEX

STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER	STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER
2530-756-1210	11		2990-993-0447	13	26
2610-089-5997	11		3030-528-4753	13	30
2805-089-0560	52	121	3040-251-2245	13	7
2805-231-8080	13	1	3110-100-4162	52	183
2805-231-8080	50		3110-117-0575	60	290
2805-253-6919	56	155	3110-142-0908	59	
2805-332-3722	56	157	3110-278-7283	60	291
2805-339-5589	55	106	3110-844-7154	59	
2805-353-5912	52	249	3120-374-9710	52	138
2805-360-8326	54	239	3120-817-5081	52	135
2805-366-6248	53	204	3120-992-8299	13	2
2805-366-6249	53	217	3120-992-8416	13	2
2805-371-4615	54	252	3930-404-3456	13	2
2805-374-9746	55	108	3930-404-3461	13	2
2805-382-8033	55	104	4320-244-9924	13	2
2805-397-9648	57	265	4320-353-5884	56	
2805-399-6984	51	226	4320-992-8294	13	2
2805-424-2806	55	137	4330-277-3274	14	57
2805-428-2159	51	227	4330-804-1541	14	54
2805-428-2161	59	229	4720-241-4404	11	32
2805-505-5191	55	105	4720-253-0764	11	41
2805-524-9552	53	126	4720-253-0891	11	37
2805-528-6097	55	107	4720-253-0892	16	35
2805-536-8804	55	222	4730-098-4273	11	30
2805-540-5299	52	120	4730-098-4274	11	35
2805-554-3951	52	122	4730-098-4275	11	39
2805-554-9255	52	120	4730-231-3019	16	46
2805-554-9822	52	120	4730-231-3019	16	54
2805-555-6093	52	124	4730-278-5006	28	12
2805-574-8856	55	103	4730-540-0392	11	24
2805-605-1491	52	119	4730-540-0393	11	31
2805-624-9940	51	237	4730-541-1113	11	36
2805-624-9949	55	128	4730-541-1115	11	23
2805-640-8637	52	123	4730-541-1116	11	22
2805-733-3223	52	121	4730-546-4736	11	25
2805-986-1793	63		4730-555-0978	11	40
2910-030-3580	51		4730-561-1544	11	26
2910-247-6632	26	6	4730-684-6913	11	42
2910-255-2298	51	164	4730-715-0018	28	33
2910-269-7126	53	178	4730-715-0018	28	56
2910-328-9833	51		4730-804-1926	11	33
2910-339-4836	53	179	4730-820-0726	16	47
2910-339-4837	53		4730-925-8039	16	71
2910-364-4996	51		4820-134-4331	28	10
2910-429-2155	51		4820-134-4336	16	36
2910-513-1711	51		4820-235-3959	28	22
2910-777-7183	53	348	4820-241-4407	28	19
2910-905-9792	53	178	4820-254-5849	28	20
2920-142-0888	59		4820-254-5849	28	21
2920-177-2377	13	4	4920-235-4541	13	44
2920-356-1221	59		4920-241-5277	14	56
2920-547-4335	58	368	4920-829-7781	14	54
2920-566-7395	59		4920-832-5491	11	
2920-640-7234	59		5305-269-3213	52	461
2920-656-7411	59		5310-167-0721	13	21
2920-810-7082	62	371	5310-167-0818	14	69
2920-887-1289	62	375	5310-167-0823	13	12
2920-924-2042	62	374	5310-167-0825	13	17
2920-925-1417	58	368	5310-208-5769	28	13
2920-941-6108	62	373	5310-208-5769	28	57
2920-941-6108	62	376	5310-262-3000	57	258
2920-966-3567	59	366	5310-291-7918	51	
2920-986-1995	59		5310-496-5413	51	
2920-997-1454	59		5310-550-1130	28	42
2940-141-9025	57	258	5310-595-7237	13	29
2940-202-9653	57	258	5310-595-7237	28	49
2940-957-3768	57	167	5310-800-0695	13	15
2990-245-0008	13	39	5315-010-6749	60	293
2990-358-4789	60	305	5315-816-1794	28	45
2990-624-9956	60	279	5315-839-5822	56	162
2990-677-1771	60	295	5330-187-2962	53	178

STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER
5330-247-4063	13	43
5330-250-9582	26	11
5330-260-9311	53	349
5330-292-3984	51	219
5330-360-8381	59	225
5330-366-6351	51	221
5330-383-3549	52	210
5330-399-6982	51	220
5330-428-2162	51	230
5330-522-5358	51	
5330-536-1257	54	224
5330-536-8818	59	228
5330-579-3158	60	302
5330-579-9545	59	211
5330-584-1621	52	231
5330-599-1285	57	258
5330-599-2216	59	
5330-599-5966	53	223
5330-624-9938	13	49
5330-654-4275	63	
5330-726-0220	51	
5330-765-2842	56	156
5340-050-1591	51	443
5340-050-1591	60	306
5340-533-3511	13	50
5340-533-3511	14	81
5340-533-3511	14	82
5340-561-1545	11	34
5340-576-5545	11	29
5340-584-1612	52	235
5340-584-1613	52	236
5340-594-7136	11	27
5340-631-0888	11	38
5360-201-2031	60	283
5365-374-9707	52	215
5910-445-6891	59	
5910-538-3232	13	46
5910-668-8181	13	46
5920-284-6787	14	96
5920-892-9311	14	73
5930-134-5721	14	80
5930-224-5668	62	392
5930-259-9496	13	48
5930-274-5124	14	71
5930-655-1582	14	72
5930-775-7577	50	
5945-457-5303	13	5
6115-144-0230	13	3
6140-979-5681	13	6
6240-792-4196	28	93
6620-133-7703	28	2
6620-241-5242	28	1
6620-494-9645	28	30
6620-698-6700	28	5
6625-420-8623	28	4
6680-247-6671	28	37
6680-253-5721	28	58
6680-435-4228	26	7
6680-600-6161	28	3
6680-726-1683	28	6
6680-726-1683	28	7
6685-133-7711	28	14
9905-202-3639	11	5
9905-205-2795	11	9

REFERENCE NUMBER	MFG CODE	FIG NUMBER	ITEM NUMBER	REFERENCE NUMBER	MFG CODE	FIG NUMBER	ITEM NUMBER
AA90A2S1	66289	55	101	MS24392-8	96906	11	33
AB9TB2S1	66289	51	102	MS24392D16	96906	11	42
AC8047-1210S	01414	14	57	MS24393D4	96906	28	33
AD42A	66289	55	103	MS24393D4	96906	28	56
AF49A	66289	55	105	MS24665-285	96906	28	45
AG30	66289	55	106	MS24665-353	96906	56	162
AN6227-5	88044	53	349	MS28775-008	96906	60	302
AN6235-4A	88044	14	57	MS35059-23	96906	14	72
AN6236-3	88044	14	54	MS35333-40	96906	28	42
AN924-4	88044	28	13	MS35333-41	96906	13	21
AN924-4	88044	28	57	MS35333-42	96906	13	29
AN929-4	88044	28	12	MS35333-42	96906	28	49
AN960-10	88044	14	69	MS35335-39	96906	13	15
AN960-1016	88044	13	17	MS35343-1	96906	57	258
AN960-816	88044	13	12	MS35387-1	96906	11	9
A2437AX	82796	59		MS35387-2	96906	11	5
BW2563C	21387	59		MS35648-4	96906	51	443
C21P	73370	57	258	MS35648-4	96906	60	306
DA66A4S1	66289	52	119	MS51009-1	96906	62	371
DR25	66289	52	121	MS51011-10	96906	62	375
DR25S20	66289	52	121	MS51011-13	96906	62	373
D5949A	21387	59		MS51011-13	96906	62	376
EAB700-4	81996	13	50	MS51011-14	96906	62	374
EAB700-4	81996	14	81	MS51086-1	96906	53	178
EAB700-4	81996	14	82	MS90725-62	96906	52	461
EA112	66289	53	126	MVG4D280658	66289	13	1
EBB44B	19728	58	368	MVG4D280658	66289	50	
E155-25-12D	00624	11	35	MV461S	09990	28	23
E155-25-16D	00624	11	39	MV861S	09990	28	19
E155-25-8D	00624	11	30	MX2433	82796	59	
FHN26G1	81349	14	73	OW363	78480	53	178
F02A250V5A	81349	14	96	PF101	66289	53	204
F125	13902	28	18	PH202	66289	52	210
F65	66289	55	128	PL21	66289	60	293
GD103-1	66289	59	133	PL24	66289	52	438
GJP7403A	19728	13	3	PM108	66289	53	217
G3861	21387	59		PM111	66289	56	155
HG150D	66289	55	137	PM76	66289	60	283
H2473	21387	59		QB83	66289	51	219
K95L	66289	56		QC62	66289	51	220
LF131	66289	14	89	QD482	66289	55	222
LJ131-3	66289	57	167	QD535A	66289	56	156
LP38C	66289	53	179	QD538A	66289	53	223
LQ30A	66289	53		QD595A	66289	54	224
LX1	85357	13	6	QD615A	66289	60	305
MBG4116T	19728	58	368	QD616	66289	59	225
ME111	66289	60	290	QD631	66289	51	226
ME112	66289	60	291	QD632	66289	51	227
ME98	66289	52	183	QD633	66289	59	228
MS13931-10	96906	52	124	QD634	66289	59	229
MS13931-11	96906	52	124	QD635	66289	51	230
MS13931-12	96906	52	124	QD636A	66289	52	231
MS13932-7	96906	52	123	QD67	66289	51	221
MS13932-8	96906	52	123	QD727	66289	13	49
MS13932-9	96906	52	123	QF67B	66289	52	235
MS13933-7	96906	52	122	QF67C	66289	52	236
MS13933-8	96906	52	122	QF91	66289	51	237
MS13933-9	96906	52	122	Q18B	66289	63	
MS13957-1	96906	52	120	Q27	66289	63	
MS13957-2	96906	52	120	RC91	66289	54	239
MS13957-3	96906	52	120	RD112	66289	56	157
MS13962-1	96906	52	215	RK173	66289	52	249
MS13963-1	96906	52	138	RM1319L	66289	53	256
MS13993-1	96906	52	135	RM536	66289	54	252
MS13996-2	96906	52	125	RP927-11	66289	28	30
MS13997-1	96906	55	107	RS11	66289	28	5
MS13998-1	96906	55	108	RS2477C	21387	59	
MS13999-8	96906	55	104	SA58	66289	51	444
MS20822-16	96906	16	46	SE48-1	66289	57	265
MS20822-16	96906	16	54	SX90	82796	59	
MS24322-5A6	96906	11		TA112AS1	66289	60	288

REFERENCE NUMBER	MFG CODE	FIG NUMBER	ITEM NUMBER	REFERENCE NUMBER	MFG CODE	FIG NUMBER	ITEM NUMBER
TA155S4-12D	00624	11	23	27787	61349	28	1
TA155S4-16D	00624	11	22	28343	31682	14	56
TB155S4-8D	00624	11	24	28347-1	31682	14	56
TC322DS1	66289	60	295	28392	31682	11	2
TE6759	31682	11		28442	31682	26	11
TF96-4	66289	53	348	28536-6	31682	13	43
TS2480	82796	59		28537	31682	13	46
TT61F3	66289	28	8	28571	31682	13	44
T150S1-12D	00624	11	36	28572	31682	28	37
T150S1-16D	00624	11	40	286-776	96152	51	
T150S1-8D	00624	11	31	28624-1	31682	13	39
T84H1	66289	60	279	3C13-4-15	46259	16	36
WD50A	66289	13	26	30572	61349	28	14
XX1	66289	51	475	30573	61349	28	2
X2765	82796	59		30-666	96152	51	
YC10C	66289	14	71	33S44375-5885	94135	59	211
YC66DS1	66289	59		3600000-12V1200	78570	11	37
YC9FS1	66289	62	392	3600000-8V1200	78570	11	32
YE2	66289	28	4	378P	57733	28	6
YE435E	66289	14	70	378P	57733	28	7
YM911-9	72619	28	15	385B	57733	26	7
YM911-9	72619	28	16	4-4GTXS	45681	16	75
Y98CS1	66289	59	366	4JTXS	45681	16	44
06096	78480	53	178	41430	72781	13	30
1-1758-14R	86768	28	21	4RTXS	45681	16	45
1-1758-14R	86768	28	20	4R6XS	45681	16	43
1A32R12A6057	96259	28	22	408-00688-03	79470	13	2
10-3774	96152	51	164	408-01059	79470	13	2
105HD1-4	13174	28	11	408-01180-01	79470	13	2
11582-2	73370	57	258	408-03005	79470	13	2
1201PS	30839	14	80	408-03008	79470	13	2
13-956	96152	51		408-03009	79470	13	2
130S5-368-1200	78570	11	41	4350	10203	26	6
130000-162C102	78570	16	35	44-38	96152	51	
15-42	96152	51		47-395	96152	51	
1522881	73370	57	258	48P12	56289	13	46
1536523	70040	28	3	48P18	56289	13	46
155S7-12D	00624	11	26	5-58	08018	13	5
155S7-16D	00624	11	25	500	13228	13	7
155S7-8D	00624	11	27	591230	31947	13	4
155S9-12D	00624	11	34	6-00-9	73808	11	
155S9-16D	00624	11	38	6-4TRTXS	45681	16	57
155S9-8D	00624	11	29	6S50XS	45681	16	40
16-4	96152	51		6144R3HC3K	89326	28	10
16-456	96152	51		63080	81321	14	54
16-649	96152	51		6454458	70040	28	58
16A105	96152	51		65-172	96152	51	
16C6XS	45681	16	47	7109X1	43334	59	
17121-0	73168	13	48	8-12F50XS	45681	16	71
1815	24455	28	93	8-4TRTXS	45681	16	58
233-536	96152	51		8-8FTXS	45681	16	63
24-485	96152	51					

By Order of the Secretary of the Army:

BRUCE PALMER, JR.
General, U. S. Army
Acting Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

DISTRIBUTION:
To be distributed in accordance with DA Form 12-31 (qty rqr block #94) organizational maintenance requirements for all fixed and rotor wing aircraft.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-31 (qty rqr block #94) organizational maintenance requirements for all fixed and rotor wing aircraft.

☆U.S. GOVERNMENT PRINTING OFFICE : 1989 O - 242-451 (07004)

PIN : 009619-000